Kent-7-1931

January

25 Cents

THE NEW Science and Invention

IN PICTURES

THE RADIO POWER CAR

See Page 855.

IN PRIZES
$12,000.00
FOR PICTURES

See Page 856

40 NON TECHNICAL RADIO ARTICLES

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Give Me 20 Weeks

To Prove That I Can Fit You for $3,500 to $10,000 ELECTRICAL JOBS — This New Way!

S. V. SMITH

Chief Engineer Smith of the famous S. & H. Electrical Works, Chicago, is the man at the left. He is the inventor of the wonderful new way of training in actual shop type electricity, so that you can become an electrical expert in a very short time. By this remarkable new system Mr. Smith has trained such capable men that he has been able to place them easily with some of the biggest concerns in the country. His personal instruction is now within your reach.

READ THESE

"You will remember that before Mr. Unholz and I took your course of training we were doing common labor. To jump from this to a prosperous business of your own is some jump, but thanks to your wonderful training we've done it."
D. Farina, U. & F. Electrical Co.

"Alhough I have only finished 20 lessons of your training I have received a promotion and am getting a third more salary, I am grateful to you."
Anthony DeGanaar.

Amazing New Shop Type Training In Your Own Home-FREE ELECTRICAL BOOK

I CAN train you in amazingly short time to be an electrical expert commanding $3,000 to $10,000 a year and up. I say this to you without a single reservation, because I have trained hundreds of men who now hold big money positions in the electrical world. S & H men are in constant demand in the big electrical shops, everywhere. Many had never gone beyond the eighth grade in school—and yet they have stepped into big pay and independence.

When I discovered this new simple easy way to carry practical shop type electrical training to you in your home, I knew I had at last solved the one big difficulty of teaching men electricity outside of college. And electrical men everywhere quickly recognized this. They have hailed my method as the one, sure way of training for the thousands of big money jobs that await the electrical expert in this fast growing field. Since making my discovery I have turned out hundreds of men who are succeeding. In all branches of big money electrical work they are proving that the S. & H. shop type training is the greatest system ever devised as a quick, easy way to the best jobs in electricity. You can get S. & H. actual shop type practice nowhere else. It is fully protected by U. S. copyright.

All Branches of Electricity

No matter what branch of electricity you want to learn my training gives it to you. In a few months I make you a thorough, competent electrical technician, with the title E. T. I train you so that when you are graduated there is no phase of electrical work you are not familiar with—and know a lot more about than the other fellow. My training covers every type of work in electricity.

Men Are Needed

Do you know that more than half the business of the United States is electrical in nature? This great field pays big money and is alive with countless opportunities. Every day we have the opportunity to place men in the better jobs. When you enter the profession you can't afford to be without the prestige and backing of the S. & H. Electrical Works.

Free Outfit

If you will mail coupon at once you will be entitled to my remarkable offer of a complete outfit of electrical apparatus, instruments and appliances for experimental and practical home shop work. Just as the famous EMPLOYMENT SERVICE and UNLIMITED ADVISORY SERVICE of the S. & H. Electrical Works is without cost so is this COMPLETE OUTFIT, ABSOLUTELY FREE to my students—but for a *short time only*. And even that isn't all. I have yet another remarkable offer, but haven't space to tell it here. You must act AT ONCE. Send coupon right now.

S. V. SMITH
S. & H. Electrical Works
Dept. A-2
1422 W. Monroe Street
Chicago, Ill.

Mail For Free Offer

Chief Engineer Smith, S. & H. Electrical Works, Dept. A-2, 1422 W. Monroe St., Chicago, Illinois.
Please send me catalog and full particulars of your training in practical electricity and details of your remarkable free offer to those who enroll now. I understand this is free and does not obligate me in any way.

Name .....
Address .....
City ..... State .....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Get Ready For a Big Pay Job

Be an Electrical Expert

Men like you are needed right now to fill big-paying jobs in the electrical field. There never was a time when opportunities for money-making were as good as they are now. Good jobs are open everywhere to men who know "what's what." Electrical Experts earn from $12 to $30 a day. Even the ordinary electricians get top-notch pay. Why don't you get in on this and get a real man's size job now? With my simplified Electrical Course I can quickly fit you to hold one. Read W. E. Pence's letter below. This is only one of thousands of such letters I have received.

Earn $75 to $200 a week

You Can Be a Big Money Maker

I have trained over 20,000 men in electricity—thousands of successful men all over the world attribute their success to my training. I can make you successful too. In fact I will guarantee your success. If you will follow my home study course you can become an expert, drawing a fat salary, in the same time it takes you to get a little raise in the work you are doing now.

Jumps From $125 A Month to $750 and Over

READ the Story of W. E. Pence

W. E. Pence
in his working togs

Chehalis, Wash.,

Mr Cooke:—

When I enrolled with you less than a year ago I was a common mechanic earning $25 to $30 a week. Today I am an "Electrical Expert" with a business of my own that gives me a clear profit of over $750 a month.

I have more work than I can do. The people around Chehalis come to me to fix their starters, generators and ignition troubles because they know that I know how to do it right.

My success, I owe to you, Mr. Cooke. The thorough practical training which you gave me through your Easily-learned Home Study Course in Electricity has made me an independent, highly respected business man in this community. Sincerely yours, W. E. Pence.

Age or Lack of Education No Handicap

No matter how old or how young you are, or what education you have, there is a real future for you in electricity. If you can read and write I can put you on the road to success. I can help you to a position that will make people admire you and look up to you.

Cash In on Your Spare Time

Use your spare time to get a better job. Most of us have enough spare time every day to sell a little at about $10.00 an hour. Sell some to yourself at this price. Watch how quick you will earn the money back if you put the time into study.

Electrical Working Outfit Free

Every man who enrolls for my electrical course gets a big outfit of tools, material and instruments free. This includes an electric motor and other things not usually found in a beginners outfit. These are the same tools and the same material you will use later in your work. Everything practical and good right from the start.

I Guarantee Your Complete Satisfaction

I am so sure I can make a big pay electrical expert out of you that I guarantee your success. I agree under bond to return every cent you pay me for tuition when you have finished the course, if you are not satisfied that it is the best investment you have ever made. If you don't make good, this million dollar institution will.

Act Right Now

Let me send you my big free book giving details of the opportunities electricity offers you and a sample lesson also free. Mail the coupon and get this at once. Learn how other men "got themselves ready to hold good paying jobs" and how I can help you do the same. This is your big chance—take it.

L. L. COOKE, Chief Engineer
CHICAGO ENGINEERING WORKS, Dept. 21
2150 Lawrence Ave., Chicago

L. L. Cooke
Chief Engineer, Chicago Engineering Works,
Dept. 21 2150 Lawrence Ave., Chicago, Ill.

Dear Sir: Send at once Sample Lessons, your Big Book, and full particulars of your Free Outfit and Home Study Course —all fully prepaid without obligation on my part.

Name.....

Address.....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Vol. XI.
Whole No. 129

Science and Invention

FORMERLY

ELECTRICAL EXPERIMENTER

January, 1924
No. 9

PUBLICATION OFFICE: 542 Jamaica Ave., Jamaica, N.Y.
EDITORIAL & GENERAL OFFICES: 53 Park Place, New York City

Published by Experimenter Publishing Company, Inc. (H. Gernsback, Pres.; S. Gernsback, Treas.; R. W. DeMott, Sec'y).
Publishers of SCIENCE AND INVENTION, RADIO NEWS, and PRACTICAL ELECTRICS

Table of Contents for January

POPULAR SCIENTIFIC ARTICLES

EDITORIAL 849
GLASS ENCLOSED CITIES OF TO-MORROW.... 850
MOVIES MANUFACTURE OWN LIGHTNING..... 851
By Phil Gersdorf.
BLACK LIGHTNING 851
By T. L. Walker.
SOLAR ECLIPSE PHOTOS 851
By W. E. Burton.
COKE AND OIL AS COAL SUBSTITUTES 852
TURBINE-LIKE MACHINE FOR TIDE POWER.... 852
AUTOMOTIVE IMPROVEMENTS OF THE YEAR.... 853
MAKING BUTTERFLY TRAYS 854
By Dr. Ernest Bade.
RADIO POWER ASSURED (Cover Article) 855
By H. Gernsback.
FIRST PRIZE WINNERS IN $1,000.00 AWARD FOR PICTURES 856
THE AIRPLANE OF THE FUTURE 857
By H. Winfield Secor.
THE MAN ON THE METEOR 858
By Ray Cummings.
DR. HACKENSAW'S SECRETS—No. 25—THE SECRET OF THE SUBMARINE CITY 860
By Clement Fezandié.
ZEV-PAPYRUS RACE, CAMERA WAR 862
By W. B. Arvin.
"SURE THINGS" AT THE COUNTY FAIR 863
By W. C. Kelly.
STEAM DRIVEN AIRPLANE 864
By Dr. Armin Demuth.
"DAYLIGHT" FOR THE STAGE 865
By A. P. Peck.
ENGINEER PREDICTS RAIL FUTURE 866
MILLION TON METEORITE FOUND 867
SMALL TURBINE DRIVES HUGE GENERATOR.. 867
By Dr. Armin Demuth.
GIGANTIC ARIZONA CAVERN 868
By John W. Wells.
THE CHEMISTRY OF BREAD MAKING..... 869
By Ismar Ginsberg, B.Sc., Chem. Eng.
CHART OF THE DEVELOPMENT OF MAN..... 870
By Dr. O. Hauser.
HUGE WIND POWER SYSTEM 871
By Raymond Francis Yates.
A MILLION VOLTS UNDER CONTROL! 872
REVERSIBLE TURBINE 874
PARLOR, BEDROOM AND KITCHENETTE 875
HORIZONTAL INDICATOR FOR PLANES 875
By Stanley Y. Beach.
MAGIC FOR EVERYBODY—NO. 10 OF A SERIES.. 877
By Prof. Joseph Dunninger.
THE HEAVENS IN JANUARY 878
By Isabel M. Lewis, M.A., of the U. S. Naval Observatory.
MEASURING THE STARS' HEAT 879
By Edison Pettit, Astronomer, of the Mt. Wilson Observatory.
CAN YOU ANSWER THESE PROBLEMS? 880
By Ernest K. Chapin.
SCIENTIFIC MISCONCEPTIONS 881
By Raymond B. Wailes.

PRIZE CONTESTS

FIRST AWARDS IN $12,000.00 CONTEST FOR PICTURES 856
PRIZE AWARDS IN "TOY" CONTEST 873
CIGAR BOX CONTEST 876
HOW-TO-MAKE-IT DEPARTMENT—$30.00 IN PRIZES MONTHLY 887
SCIENTIFIC HUMOR—PRIZES FOR BEST JOKES 900

AUTOMOBILES

AUTOMOTIVE IMPROVEMENTS OF THE YEAR.. 853
DEMONSTRATION CAR "CUT IN HALF" 853
RADIO POWER FOR AUTOS ASSURED 855
By H. Gernsback.

ELECTRICITY

ELECTRICITY FROM THE TIDES 852
ELECTRIFIED RAILROADS OF TO-MORROW..... 866
SMALL TURBINE DRIVES HUGE GENERATOR.. 867
HUGE WIND POWER SYSTEM DEVELOPS ELECTRICITY 871
A MILLION VOLTS UNDER CONTROL! 872

RADIO ARTICLES

HOW TRANS-ATLANTIC RADIO MESSAGES ARE TRANSMITTED AND RECEIVED 888
RECENT ADVANCES IN RADIO APPARATUS 889-890
RADIO MAKES TRANSOCEANIC CIRCLE 891
LATEST DESIGNS IN RADIO CABINETS 891
SENDING PHOTOS BY RADIO 892
THE BIOGRAPHY OF A VACUUM TUBE 893
By Jack Kay.
UNTUNED PRIMARY RECEIVER 895
By W. L. Pearce.
RADIO FOR THE BEGINNER—NO. 23—INDUCTANCE 896
By Armstrong Perry.
RADIO ORACLE 897-898
RADIO WRINKLES—Edited by A. P. Peck 931

CONSTRUCTOR ARTICLES

GHOST SPECTACLE FOR AMATEUR STAGE..... 882
STAGE EFFECTS FOR MINIATURE THEATRE.... 883
By Dr. Ernest Bade.
STEREOSCOPIC DRAWING METHOD 884
By Ernest K. Chapin.
HOME-MADE LABORATORY EQUIPMENT 884
By Chas. D. Tenney.

CHEMISTRY ARTICLES

THE CHEMISTRY OF BREAD MAKING 869
By Ismar Ginsberg, B.Sc., Chem. Eng.
HOME-MADE CHEMICAL LABORATORY EQUIPMENT 884
WRINKLES, RECIPES & FORMULAS—Edited by S. Gernsback 886

ASTRONOMY ARTICLES

SOLAR ECLIPSE PHOTOS 851
MILLION TON METEORITE FOUND 867
THE HEAVENS IN JANUARY 878
MEASURING THE STARS' HEAT 879

HOW TO SUBSCRIBE FOR "SCIENCE AND INVENTION." Send your name, address and remittance to Experimenter Publishing Co., 53 Park Place, New York. Mention the name of the magazine you are ordering. We also publish RADIO NEWS and PRACTICAL ELECTRICS.

RATES AND TERMS. The subscription rate for SCIENCE AND INVENTION is $2.50 per year. (12 numbers.) When remitting do so by check, money order or registered letter, if cash is enclosed. Avoid sending cash through the mail if possible. Subscriptions for less than one year are not accepted. Subscriptions may be made in combination with RADIO NEWS or PRACTICAL ELECTRICS with considerable saving. Send postal for special rates. Subscriptions start with the current issue, unless otherwise ordered.

POSTAGE. We prepay postage in all parts of the United States, Mexico and Island possessions. For foreign or Canadian subscriptions we require 50 cents in addition to the subscription price for additional postage charges.

CHANGE OF ADDRESS. Notify us as far in advance as possible. It requires several weeks to make an address change on our records. Always write clearly, giving your old address as well as your new.

ON EXPIRATION of your subscription we enclose a renewal blank in our last number to you and notify you otherwise. Unless we receive your order for a renewal, with your remittance, we stop our delivery to you on expiration.

COMMUNICATIONS to us should always bear your full name, address and when possible the number which appears on your wrapper every month."

SCIENCE AND INVENTION is published on the 25th of each month. There are 12 numbers per year. Subscription price is $2.50 a year in U. S. and possessions. Canada and foreign countries $3.00 a year. U. S. coin as well as U. S. Stamps accepted (no foreign coin or stamps). Single copies, 25 cents each. A sample copy will be sent gratis on request. Checks and money orders should be drawn to order of EXPERIMENTER PUBLISHING CO., Inc. If you change your address notify us promptly, in order that copies are not miscarried or lost.

All communications and contributions to this journal should be addressed to Editor, SCIENCE AND INVENTION, 542 Jamaica Avenue, Jamaica, New York, or 53 Park Place, New York City, N. Y. Unaccepted contributions cannot be returned unless full postage has been included. ALL accepted contributions are paid for on publication. A special rate is paid for novel experiments; good photographs accompanying them are highly desirable.

SCIENCE AND INVENTION. Monthly. Entered as second-class matter at Jamaica, N. Y., Post Office, under act of Congress of March 3, 1879. Title Registered at the Patent Office. Copyright, 1923, by E. P. Co., Inc., New York. The Contents of this Magazine are copyrighted and must not be reproduced without giving full credit to the publication.

SCIENCE AND INVENTION is for sale at all newsstands in the United States and Canada; also at Brentano's, 37 Avenue de l'Opera, Paris. Member of the Audit Bureau of Circulation.

New York City. General Advertising Dept., 53 Park Place.

Western Advertising Representatives. Finucan & McClure, 720 Cass St., Chicago, Ill.

Pacific Coast Advertising Representatives, A. J. Norris Hill Co., Hearst Bldg., San Francisco, Calif.

Kansas City Advertising Representative, George F. Dillon, Republic Building, Kansas City, Mo.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Discovers Amazing Way to Grow Hair

Alois Merke, Founder of Famous Merke Institutes, Perfects New Method Which Brings Results in a Few Days

WILL baldness soon be a thing of the past? So it would seem—at least if we are to judge by the remarkable results being performed daily at the Merke Institute, Fifth Avenue, New York. For here hundreds of men and women—many of whom were almost completely bald — are rapidly acquiring full growths of wonderfully thick luxuriant hair, without even a trace of bald spots. As for dandruff and falling hair, these ailments are often banished after the first few treatments with this new method.

The discoverer of this new treatment is Alois Merke, a hair specialist of international reputation. His discovery, which for the first time provides a method of penetrating to the hair roots and bringing nourishment direct to them, is the result of a long experience in treating baldness, which included many years at Heidelberg, Paris, Berlin, Cairo, Buenos Ayres and other centers of dermatological research. It works on a plan entirely different from any known or used before.

At the Merke Institute, Alois Merke has treated scores of prominent stage and social celebrities, many gladly paying $500 or more for the marvelous restoration of hair effected. But, desiring to place his discovery within reach of rich and poor alike, he recently perfected a method whereby these same results can be secured for only a few cents a day right in your own home. The treatment may be taken in any home in which there is electricity.

Free Booklet About New Home Treatment

Through special arrangement readers of this publication may secure without cost, all details of this new home treatment to make hair grow. A 32-page booklet fully describing the Merke treatment, will be sent postpaid on receipt of the coupon below, properly filled in. No matter how long you have been bald —no matter if you are completely bald —no matter how many different treatments you have taken without results, this booklet will prove of the deepest interest to you. So send for it to-day. Merely mail the coupon and it will be sent you by return mail.

Allied Merke Institutes, Inc.,
512 Fifth Ave.,
Dept. 461,
New York City.

Actual Results

(Dozens of letters like the following are received every day by the Merke Institute)

"In the short time I have used your treatment I have gained remarkable results. Dandruff has disappeared entirely. My scalp is now all full of fine new hair. I would not part with my treatment for 10 times its cost." A. W. B.

"The top of my head is now almost covered with new hair about one-half inch long. I have been trying five years, but could never find anything to make my hair grow until your treatment." T. C.

"Ten years ago my hair started falling. I used hair tonics constantly, but four years ago I displayed a perfect full moon. I tried everything — but without results. Today, however, thanks to your treatment, I am pleased to inform you that I have quite a new crop of hair one inch long. My friends are astonished at the result." F. H. B.

ALLIED MERKE INSTITUTE, Inc.,
512 Fifth Avenue, Dept. 461,
New York City.

Please send me a copy of your free booklet, "The New Way to Make Hair Grow," which describes the Merke Institute home treatment in detail.

Name .....
(State whether Mr., Mrs. or Miss)

Address .....

City ..... State

Digitized by Google
Original from UNIVERSITY OF CHICAGO

JUST OFF THE PRESS

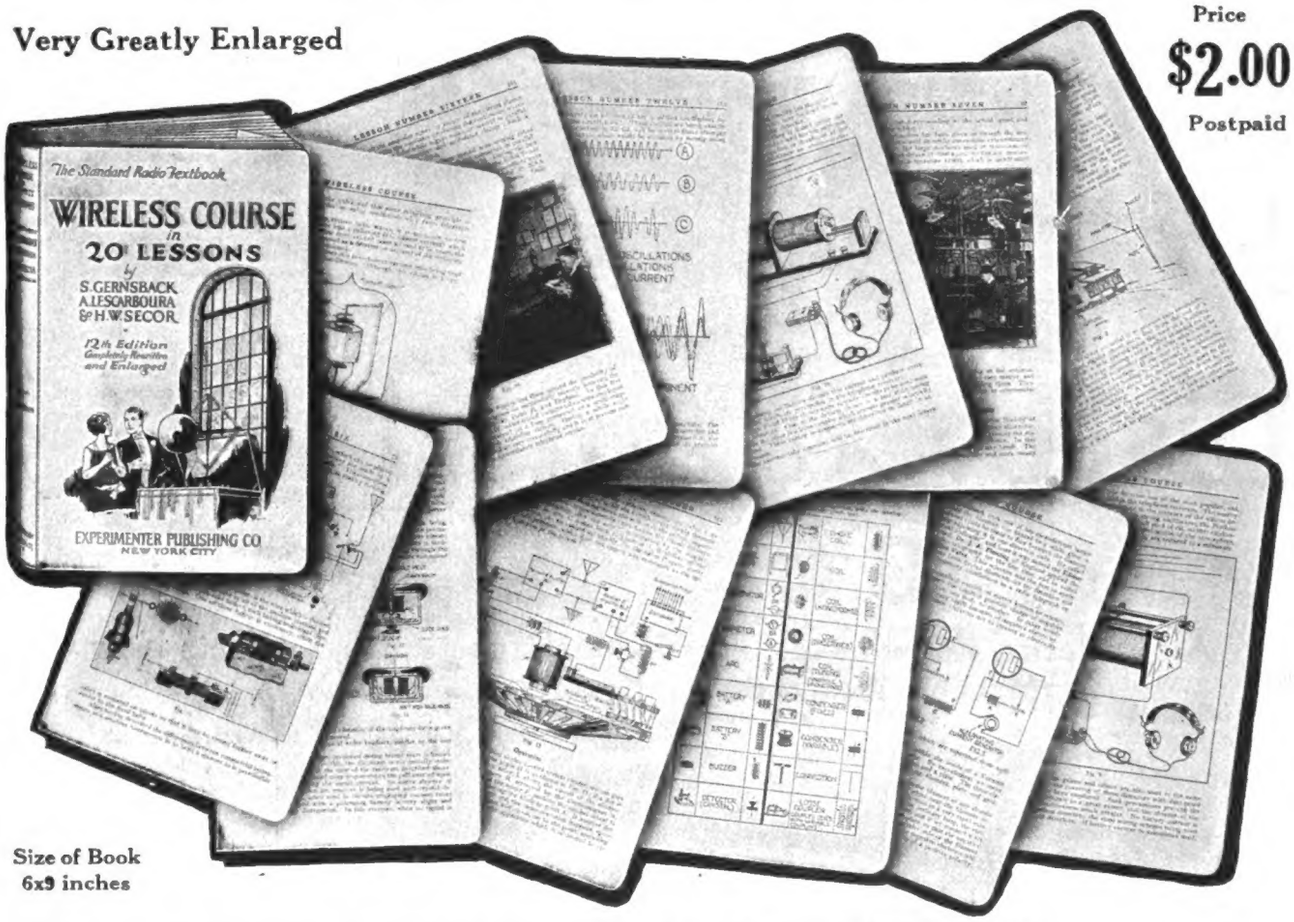
12th Edition

WIRELESS COURSE IN 20 LESSONS

By S. GERNSBACK, A. LESCARBOURA and H. W. SECOR

Very Greatly Enlarged

Price
$2.00
Postpaid



Size of Book
6x9 inches

264 pages. 500 illustrations, diagrams and photographs. Binding de luxe; black leatherette cover, genuine gold stamped; red edges; round corners; semi-flexible covers; multi-colored jacket.

This new edition contains over 100 pages more than the previous editions, of which over 100,000 were sold. It is printed in a larger type, on better paper and has better and more illustrations.

Lesson No. 1: Principles of Electricity:
History and Explanation of Electricity, etc.
Lesson No. 2: Principles of Magnetism:
The History and Explanation of Magnetism, etc.
Lesson No. 3: Dynamos, Motors, Generators, and Wiring:
Explanation of Construction and Operation of each of the above, etc.
Lesson No. 4: Principles of Wireless Telegraphy:
History and Explanation of the Wave Transmission and those concerned in the development of early radio, etc.
Lesson No. 5: Amateur Transmitting Sets and Apparatus:
Apparatus and Circuits used by Amateurs in the early days of radio telegraphy, etc.
Lesson No. 6: Transmitting Sets (Continued):
Apparatus and Circuits of Transmitting Apparatus, etc.
Lesson No. 7: Commercial Transmitting Systems:
Apparatus and their operation, etc.
Lesson No. 8: Aerials and Underwriters Installing Regulations:
Explanation of the Antenna System and Constructional details of the various types used. Official regulations, etc.
Lesson No. 9: Radio Receiving Apparatus:
Description of the Various Types of Receiving Apparatus with an explanation of their operation, etc.
Lesson No. 10: The Detector:
An explanation of the various types of detectors used for reception purposes, including circuits, etc.
Lesson No. 11: The Vacuum Tube as a Detector:
Principles of operation of the vacuum tubes, etc.
Lesson No. 12: Regenerative Receiving Set:
Description and explanation of various vacuum tube circuits, etc.
Lesson No. 13: The Vacuum Tube as an Amplifier:
Operation of the types of amplifiers as in conjunction with tuners. Loud Speakers, etc.
Lesson No. 14: Practical Vacuum Tube Circuits:
An explanation of various up-to-date Circuits used in Radio, etc.
Lesson No. 15: Super-Regenerative Receiver:
Operation of the Super-Regenerative Receiver, etc.
Lesson No. 16: Vacuum Tube Transmitter:
Vacuum Tube Transmission and Broadcasting Systems, etc.
Lesson No. 17: Radio Compass—The Wavemeter—Radio Control:
The Radio Compass. Principles and operation of the Wavemeter and Radio Control, etc.
Lesson No. 18: Learning to Operate—The Codes—The Wireless Law:
Methods of learning the International Code. Appendix: Detailed regulations of the wireless law, etc.
Lesson No. 19: History of the Development of Radio:
A progressive history of radio and those concerned in its progress, etc.
Lesson No. 20: Mathematics of Wireless Telegraphy and Appendix:
Formulas for the Calculation of Wave-length, Inductance, Capacity, and other measurements, etc.

Sent postpaid upon receipt of $2.00

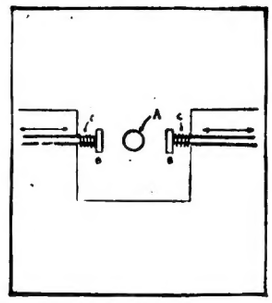
If your Dealer cannot supply you, order direct from us, giving Dealer's name and address

Experimenter Publishing Co., 53 Park Place, New York, N.Y.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

A Problem in Invention Can You Solve It?

This simple test will show whether or not you have inventive ability; thousands have it and do not know it, or *do not develop it.* Yet invention is the easiest way to earn a fortune. No technical or scientific knowledge necessary. Read below a few instances of how little ideas have made millions of dollars for their inventors.



Here is an interesting little problem in invention. Its solution will be found very simple, if we really think.

"A" is the end of a shaft. The two members "B B" are free to move in either direction indicated by the arrows. If they are pushed back, the springs "CC" will immediately pull them forward again.

Our problem is to put some kind of an attachment on the revolving shaft "A" so that the members "B B" will be pushed back both at the same instant every time the shaft "A" makes a single revolution. The device on shaft "A" must also allow the two members "B B" to come forward once in every revolution. What would you suggest putting on the shaft "A"?

HOW would *you* like to get the royalty paid to the inventor of the tin cap used on millions of bottles? How much money would *you* have now had you thought of the simple idea of putting rubber tips on pencils? Wouldn't you gladly be the inventor of the Gillette Safety Razor, who it is said made as much as TWO AND ONE-HALF MILLION DOLLARS *a year?* The inventor of the tiny snap-fastener recently paid an *income tax* of $29,000, or be the man who invented the President Suspenders who is now worth $5,000,000. The inventor of the autographic attachment for cameras sold his patent rights for $300,000.

Ideas Worth Fortunes

One single idea—as simple as any of these — can make you independently wealthy in a short time. Other inventors have made hundreds of thousands of dollars from such common things as the crimped hair-pin, the metal-tip shoe lace, the paper safety match, the ordinary wire paper clip. These are certainly not complicated inventions—they are so simple, in fact, that probably *thousands* of people thought of them but only *one* man DID anything about the idea when it came to him.

You, too, probably have ideas for needed inventions — and the only reason you have not turned your ideas into gold is because, like thousands of other persons, you doubt your own ability to invent. Or, like most persons, you believe that an inventor must be born; that every inventor is a man of genius who invents things as naturally as other people do their work as bookkeepers, mechanics, doctors or farmers.

Invention Can Be Learned

But this is not true. What were our great inventors *before* they invented anything. Bell was a teacher. Edison was a telegrapher. Gillette and Waterman were traveling salesmen. Better proof than this is that you can satisfy yourself that invention is not limited to geniuses or that it is merely guesswork, luck or chance. You can prove to yourself that invention—*any* invention, from the collar button to the colossal railroad engine—is the result of the same kind of thought that you use in adding a row of figures.

Just think, for a moment, what you do in any example in addition. You *see* a problem—the row of figures. You recognize that a result is wanted —the sum of the figures. From these two facts you go ahead and get the result. And because only one answer can be correct for that particular example, you know you solve your problem when you find that answer.

Proof YOU Can Invent

Exactly the same thing is true in invention. This is the proof. At the top right-hand corner of this page is shown a simple problem in invention. What would *you* put on a shaft "A" to force members "B B" to move back at the same time. A little thought will show you the correct answer within a few minutes.

This test of your inventive ability, simple as it is, illustrates the thought behind every invention. Like your arithmetic example you see first, a problem to be "fixed." Then you think of something which will "fix it," something which is the only correct answer to your problem. That is all—that is *everything*—to invention. Brought down to its plainest definition, invention is merely the science of "fixing things."

And how many times a day you do "fix things." A leaking faucet, a rattling window, a wabbly table—you fix hundreds of things like these every year. And, though you may never have realized it, every time you "fix things," you use the very definite exact principles which are the basis of Inventive Science!

Raymond F. Yates, who with fourteen other famous inventors, now makes it easy for you to learn how to invent in your spare time at home.

What Edison Says

Could you ask the advice of any greater authority than Thomas A. Edison? He says: **"Invention is a Science and should be taught as a profession."**

And now for the first time, you can profit by Edison's advice. You can actually learn invention as a profession — exactly as other people are learning electricity, mechanics, law, medicine. It doesn't matter who you are, or what your present work is — you have the native ability to invent. No special knowledge of mechanics or science is necessary.

The Bureau of Inventive Science offers you the first course in practical invention ever devised. It has written down the easy-to-learn principles of Inventive Science so that everybody can read them and learn to use them. The ability to invent was *born* in you. You already possess the instinct to fix things. What you need now is to develop this ability, this instinct so you can use it to produce inventions. All you need, to become successful, is this easy, fascinating training which will develop your ability so it will be worth real money. Fifteen famous inventors tell you WHAT TO INVENT and HOW TO INVENT. They tell you the secrets of invention which every successful inventor knows. They explain how to originate ideas, how to develop and perfect them, how to get patents. But they tell you even more: Thousands of inexperienced inventors have been defrauded of their rewards because they did not know how to protect their patent rights. This great course tells you everything you want to know—how to sell your invention, how to get royalties—how to get the most money for your ideas.

15 great inventors teach you every step in inventive science.

- —How to develop your imagination
- —How to develop your ideas
- —How to get the facts you need for inventions
- —How to keep legal records of ideas
- —How to use scientific principles of mechanics
- —How to avoid wasting time on impractical inventions
- —How to apply for a patent
- —How to organize a company
- —How to protect your rights
- —How to market a patent

and hundreds of other vitally important facts which EVERY successful inventor knows and uses.

New FREE Book

The most fascinating part of this great new course is that it teaches invention by actual practice, right in your own home. With each lesson you are sent some problem in invention—just like the one you worked out here. This fascinating exercise in solving actual problems in invention sharpens your instinct to fix things. Better than anything else it gives you an unforgetable, instinctive habit of thinking inventively which is worth more than you realize. In fact, the lessons and exercises are so simple, so easy to understand, so interesting, that they seem more like a pleasant game than like instruction which can make you a successful inventor.

A wonderful new book, just printed, tells you more about the Bureau of Inventive Science and its simple new course in invention. It costs nothing, so send the coupon at once. Hundreds of years ago, the world needed only few things, so few inventions were made. But now the world has more needs, more things to be "fixed." Every day you see things which must be improved. Every day you run into problems which a simple idea can solve. It may be a new toy for or your children. The man who invented the Kiddie-Kar, it is reported, made over $5,000,000. It may be a new kind of soap. E. T. Babbitt is worth millions of dollars today. It can even be a new kind of broom to make housework easier for millions of housewives. But no matter what it is—if your idea is practical, if it solves a problem, if it satisfies a need—a fortune may be waiting for you. This bureau is not connected with patent attorneys or manufacturers. Its only purpose is to teach you the principles of practical invention used by every successful inventor. Write for the FREE BOOK now.

Bureau of Inventive Science
Dept. 71
Wisner Building Rochester, N. Y.

Bureau of Inventive Science,
Dept. 71, Wisner Building,
Rochester, N. Y.

Please send me your free book, "The Science of Invention."

Name .....

Address .....

City ..... State.....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

BUILD YOUR SET BETTER–AT LOWER COST

SUPER 180° VARIOCOUPLER

H521 Each.....98c
A wonderful value, produces excellent results. Green silk windings on black fibre tubes. Rigid mounting support for table or panel mounting. Primary tapped for fine tuning. ¼ inch shaft. Range 200 to 600 meters.
H522 Variometer—same style. Each...98c

SUPERIOR VARIOCOUPLER

H523 Each.....$3.15
A handsome instrument of superior design and construction. Stator tube and rotor ball of moulded red brown bakelite. Large size green silk windings insure highest efficiency. Table or panel mounting. ¼ inch shaft. Superior results in circuits for 180 to 650 meters. Tapped primary for finest tuning. Noiseless contacts.

H526 Special single circuit type....$3.60

SUPER MOULDED VARIOMETER

H412 Each.....$2.60
Polished black moulded rotor and stator forms. Maximum inductance with greatest efficiency and minimum distributed capacity. A high grade instrument that will get the best results. Wave length 180 to 600 meters.

EXCEL MOULDED VARIOMETER

H524 Each.....$3.68
A wonderful value at our price. Properly designed and constructed. Polished black bakelite rotor and stator forms, large size. Green silk wire insures greatest efficiency. ¼ inch shaft. Noiseless pigtail connection. Table or panel mounting.

SUPERIOR VARIOMETER

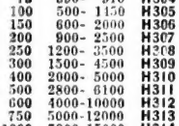
H525 Each.....$4.45
Forms moulded of red brown bakelite. A neat handsome instrument. Green silk windings calculated for highest efficiency. ¼ inch shaft. Noiseless pigtail connections. Table or panel mounting. Produces superior results in any type circuit 180 to 650 meters.

RADIO INDUCTANCE COILS

Carefully made — fine looking coils. Highest efficiency. Low distributed capacity effect, low resistance — high self inductance. Very firm impregnation. Range given is in meters when used with .001 variable condenser. Mounted coils have standard plug mountings.

Turns	Range	Art No.	Mntd.	Art No.	Mntd.
25	120- 250	H301	$0.39	H320	$0.80
35	175- 450	H302	.42	H322	.94
50	250- 720	H303	.49	H323	1.00
75	390- 910	H304	.54	H324	1.06
100	500- 1150	H305	.58	H325	1.11
150	600- 2000	H306	.63	H326	1.15
200	900- 2500	H307	.72	H327	1.24
250	1200- 3500	H308	.78	H328	1.33
300	1500- 4500	H309	.82	H329	1.34
400	2000- 5000	H310	.97	H330	1.55
500	2800- 6100	H311	1.12	H331	1.60
600	4000-10000	H312	1.27	H332	1.75
750	5000-12000	H313	1.43	H333	1.90
1000	7900-15000	H314	1.70	H334	2.25
1250	9750-19500	H315	1.92	H335	2.40
1500	14500-26500	H316	2.18	H336	2.55

INDUCTANCE COIL MOUNTINGS



H340—3 Coil. Ea. $3.40
H341—2 Coil. Ea. 2.75
Sturdy, rigid durable construction. Made of polished black bakelite. Mount on front of panel.

BACK OF PANEL MOUNTING

Mounts back of panel, with knobs or dials on front of panel. Helps make a neat efficient set. H342—Each $4.45

COIL MOUNTING PLUGS

Made of genuine bakelite.
H344 Plug for mounting "honeycomb" inductance coils 39c
H345 Stationary plug to fasten mounted coil stationary to panel 42c
H346 Movable plug to fasten mounted coil to panel so it can be rotated.....89c
H343 Fibre strip to hold coils for mounting. Two foot piece 15c

SPIDER WEB COILS

H290— 25 turn 39c H292—50 turn 47c
H291— 35 turn 42c H293—75 turn 54c
H294—100 turn. Each.....68c
A new popular type of inductance of highest efficiency. Lowest distributed capacity and lowest high frequency resistance. Firm green silk windings with fibre mounting strips.

OUR SPECIAL VARIOMETER AND VARIOCOUPLER

Build into your set reliable instruments. You can depend on this variometer and variocoupler to give you the best results in any circuit working from 180 to 650 meters. In design and construction they are the best. Only the highest grade materials are used. The prices quoted save you 30 to 40 per cent. Why pay more?

H418 Variocoupler. Each.....$2.45
The most efficient type of coupler, insures better tuning and louder signals. Primary and secondary wound on natural uncolored genuine bakelite tubes. Handsome green silk windings. Primary tapped for fine tuning. Can be panel or table mounted. ¼ inch shaft.

H410 Variometer. Each.....$2.10
Perfect in design and construction. Accurate wood forms thoroughly seasoned. Correct inductive ratios. Solid baked windings. Plenty of large sized wire insures highest efficiency. A strong high grade instrument that will give you lasting service. ¼ inch shaft.

ULTRA AUDION COIL

H297 Each.....85c
Spider web wound of green silk covered wire. Four taps. Produces wonderful results. Fibre strips and wooden rod for mounting included. Directions furnished.

STRANDED ANTENNA WIRE

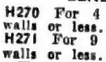
Cabled of fine copper strands. Very flexible. High tensile strength. Best for aerials.
H248 100 ft. coil 58c H249 500 ft. coil $2.75

MAGNET WIRE

Insulated copper wire. Best quality even drawn wire, one piece to a spool. Prices quoted are for 8 oz. spools unless otherwise stated.

Double Cotton Covered		Enameled Insulation		Green Silk Covered	
Number H990		Number H992		Number H991	
Gauge	Price	Gauge	Price	Gauge	Price
18	.43c	20	.39c	20	$0.78
20	.55c	22	.50c	22	.95
22	.70c	24	.55c	24	1.10
24	.80c	26	.60c	26	1.38
26	.90c	30	.65c	30 (4 oz.)	1.25
28	$1.05	32	.70c	32 (4 oz.)	1.65
30	1.45	36	.90c	36 (4 oz.)	2.20

ANTENNA INSULATORS



H260

H260 Size 1x3¼. Composition, metal eyelets. Two for 17c
H263 Ribbed Porcelain insulator. 2½ in. long. Ea. 6c
Dozen 55c

LEAD-IN INSULATORS

H270 For 4 inch walls or less.....42c
H271 For 9 inch walls or less.....69c

The only practical lead in insulator for aerial wires. Small, neat, effective, durable. Fits ⅝ inch hole. Securely locked by two adjustable nuts.

OUTDOOR LIGHTNING ARRESTER

H980 Price.....$1.55
Protect your instruments with this lightning arrester. Weatherproof porcelain case. Air gap type. Permanent. Durable. Underwriters approved.

HIGH-GRADE LIGHTNING ARRESTER

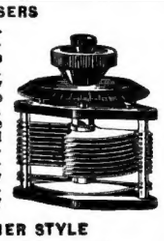
H981 Each.....79c
A dependable protector, always on guard. Small and compact. Weatherproof porcelain case. Easily fastened and connected. Underwriters approved.

BINDING POSTS

Brass, polished nickel finish. Washer and 6-32 in. screw extending ⅝ in.
H370 Large size—barrel and knob ¾" long. Dozen 85c
H370-2-4 H372 Smaler size — H376-8 barrel and knob 9-16" long. Dozen....70c
H374 Large size with composition knob. Dozen 45c
H376 Large size with hole for phone tip or wire. Dozen.....80c
H378 Small size with hole for phone tip or wire. Dozen.....35c

PANEL MOUNTING VARIABLE CONDENSERS

These are especially high grade condensers and we guarantee them to be mechanically and electrically perfect. Fine polished end plates of heavy bakelite. Shafts ¼ inch diameter. Sturdy, heavy aluminum alloy plates perfectly spaced to insure smooth, even, reliable capacity. Our low prices save you money. These condensers are of the very best make and are not to be compared with many inferior, cheap condensers offered. We guarantee them to please you or your money back. The vernier style has one separately controlled plate which permits of the finest tuning.



REGULAR STYLE

H815— 3 plate 58c
H816— 5 plate 97c
H814—11 plate .00025 mfd. $1.28
H813—21 plate .0005 mfd. 1.35
H812—43 plate .001 mfd. 1.58

VERNIER STYLE

Including Dial and Knobs

H825—14 plate .00025 mfd. $2.45
H824—26 plate .0005 mfd. 2.75
H826—46 plate .001 mfd. 3.15

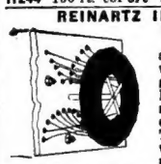
SOLID BARE COPPER WIRE

Solid bare copper wire for aerials, leads or wiring instruments.

Solid Bare Copper Wire, size 14.
H240 100 ft. coil 48c H242 500 ft. coil $2.25

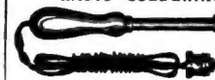
Solid Bare Copper Wire, size 12.
H244 100 ft. coil 67c H245 500 ft. coil $3.05

REINARTZ INDUCTANCE



H296 Each....$1.15
Made of green silk covered wire, spider-web wound to produce greatest efficiency and lowest losses. 21 taps so arranged that crossing is avoided. Two fibre strips and wooden rod furnished permit various styles of mounting. With this coil a high grade set can be built at a low cost. Directions included

RADIO SOLDERING IRON



H540...$1.50
Soldered connections in radio sets produce better results. This guaranteed iron is exactly right for radio work. A neat solid connection quickly and easily made. Operates on any lighting current 100 to 120 volts. 6 ft. cord with attaching plug. Length 13 inches. Heats quickly will not overheat.

Heavier irons for general repair work. Wonderful values at our prices.

H541 Medium size.....$3.48
H542 Large size..... 4.25

AUTOMATIC BLOW TORCH

H543 Each.....$1.19
Burns denatured alcohol. Automatically generates pointed flame in a few seconds. Easy to solder joints in hard places. Lights with a match. Burns 20 minutes on one filling. 5½ inches high, ⅞ inch diameter cylinders. Works fine with Tinol listed below.

SUPER BLOW TORCH

H544 Each 39c
Burns denatured alcohol. Vest pocket size. Blowing on tube produces a hot pointed flame. Lights with a match. Works fast. Burns 10 minutes on one filling. Easy to solder joints in hard places. 3 in. high. ⅞ in. cylindef. Long rubber tube. Produces fine joints with Tinol listed below.

ENCLOSED VARIABLE CONDENSERS

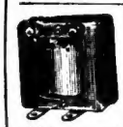
One of the best made condensers. Rigid, accurately spaced aluminum plates. Formica ends. Engraved scale. Knob and pointer. Clear transparent case.
H806 43 plate .001 Mfd. $2.80
H808 21 plate .0005 Mfd. $2.45

OUR SPECIAL AUDIO FREQUENCY AMPLIFYING TRANSFORMERS

H550 Each.....$2.25

The result of years of research work and experienced engineering. In quality of tone and volume of sound, the things a transformer is built for, we guarantee it to equal or surpass any other transformer. Neat in appearance. Carefully made. Fully mounted with plainly marked binding post connections. 5 to 1 ratio. Wonderful results on one, two or three steps without distortion or howling. A quality item in every respect. Not to be compared with articles built for price only.

OUR SPECIAL SHIELDED TRANSFORMER



H551—3½ to 1 Ratio. Each $2.55
H552—6 to 1 Ratio. Each 2.75
The same high grade style of transformer as above enclosed in a metal case which completely shields it from any outside magnetic influences. Very attractive appearance and sturdy construction. Free from howling and local disturbances.

OTHER STANDARD BRANDS AUDIO FREQUENCY TRANSFORMERS

Fresh, clean stock in original containers.

H232	Thordarson Ratio 3½ to 1	$3.40
H233	Thordarson Ratio 6 to 1	3.80
H553	Acme. Each	4.45
H554	Coto. Each	4.45
H555	Federal. Each	4.45
H712	Radio Corp. Each	6.40
H234	All American 10 to 1 Shielded	4.15
H239	All American 5 to 1 Shielded	4.10
H236	All American 3 to 1 Shielded	3.95

RADIO FREQUENCY AMPLIFYING TRANSFORMER

H560 For 201A or 301A Tubes $1.70
H561 For 199 or 11 or 12 Tubes $1.70
Due to its special design this transformer will produce wonderful results in any type of regular or reflex radio frequency circuit. While low in price we believe it equal or superior to higher priced transformers. Perfect for one, two or three stages. Compact, convenient form, easily mounted. Range 175 to 600 meters. Try it. If you are not satisfied return it and get your money back.

OTHER STANDARD BRANDS RADIO FREQUENCY TRANSFORMERS

H568	Our special—as good as any of them	$ .48
H562	Dubilier. Each	4.45
H563	Coto. Each	4.45
H565	Acme. First stage. Each	4.45
H566	Acme. Second stage. Each	4.45
H567	Acme. Third stage. Each	4.45
H714	Radio Corp. Each	5.85
H995	All American. Each	3.95
H575	Erla. First stage. Each	3.55
H576	Erla. Second stage. Each	3.55
H577	Erla. Third stage. Each	3.55
H578	Erla. Reflex. Each	4.45

NEUTRODYNE TRANSFORMERS

H571 Per set of three.....$4.95
An air core transformer for use in neutrodyne method of reception. Can also be used for tuned radio frequency or as a fixed coupler with condenser across secondary. Proper design for results and efficiency. Green silk windings on bakelite tubes with adjustable mounting brackets to fit most any condenser.

NEUTRALIZING CONDENSERS

H572 Per set of two 40c
Simple, inexpensive, effective precision type. Micrometer adjustment is attainable. Easily mounted in circuit.

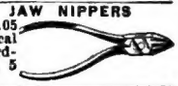
SPECIAL

H573 Neutrodyne Jack. Each.....89c

LONG NOSE PLIERS

H970 Price..95c
The handiest pliers for radio work. Made of fine hardened steel. Length, 5 in.

DIAGONAL JAW NIPPERS



H972 Price....$1.05
For fine electrical work, made of hardened steel. Length, 5 inches.

FOUR-IN-ONE Screw-Driver

H974 Each.....55c
Especially suitable for radio work. Will handle any size screw used. Smaller drivers nest inside larger one and are held in place with screw cap. Made of steel, nickel finished.

TINOL

H969 Per tube...19c
A combined solder and flux in handy form. Put a little on the connection, heat with a match, torch or solder iron and you have a neat electrically and mechanically perfect joint.

THE BARAWIK CO. Chicago's Original Radio Supply House Beware of Imitators 102 South Canal St., Chicago, Ill.

Digitized by Google Original from UNIVERSITY OF CHICAGO

WITH BARAWIK STANDARD RADIO GOODS

WE PAY TRANSPORTATION CHARGES EAST OF THE ROCKIES

PRESERVE THESE PAGES — ORDER FROM THEM AND SAVE MONEY
FAST SERVICE — TRY US AND BE CONVINCED
THE PRICES QUOTED DELIVER THE GOODS TO YOUR DOOR

OUR GUARANTEE PROTECTS YOU—We handle only the best goods, carefully tested and checked by expert radio engineers. You are assured of getting guaranteed apparatus that will give superior results. And while our goods are best, our prices are lowest. Our goods equal or surpass the claims we make for them. We do not attempt to deceive or mislead. Our reputation for fair dealing is our most valued asset.

HOW TO ORDER—Write your Order plainly, state Article Number, Description and Price of items wanted. Send Postoffice or Express Money Order, Certified Check or Bank Draft for Total of Order. Prompt Shipment is assured when these directions are followed.

VACUUM TUBES

Standard Brands—Cunningham, Radiotron. Every one guaranteed new and perfect. We will ship brand in stock unless you specify otherwise.

H105 Detector UV200 C300 Each $4.38
H112 Amplifier, UV201A CS01A. 5.85
H118 5-Watt Transmitter.. 7.70
H107 WD11 C11. Each.... 5.85
H101 WD12 C12. Each.... 5.85
H102 UV199 C299. Each..... 5.85
H104 UV199 Adapter fits 199 tube to standard socket ..... .42
H108 WD11 Socket. Each..... .31
H109 WD11 Adapter. Each..... .45

STANDARD TUBE SOCKET

H140 Each 39c
Moulded of genuine red brown bakelite. Binding post connections. For table or panel mounting. Neat and strong.

METAL TUBE SOCKET

H146 Each.....39c
A strong durable socket for panel or table mounting. Metal tube and base. Plainly marked binding post connections well insulated.

TWO AND THREE GANG SOCKETS

These sockets make it easy to build detector and amplifier units and make a neat, compact workmanlike job.
H147 Two-gang socket 95c
H149 Three-gang socket $1.30

199 SOCKET

H145 Each ..... .49c
Moulded of high insulating material. Sponge rubber base prevents ringing in tube. Plainly marked binding post connections. Neat and compact.

FILAMENT CONTROL RHEOSTATS

H132.6 ohm. Each.....45c
H129 20 ohm. Each....52c
H131 30 ohm. Each....59c
H135 6 ohm Vernier....95c
Best grade. Will give real service. Durable and lasting. High heat resisting base, diam. 2⅛ in. Tapered polished black knob 1¼" diam.
Potentiometers. Match above rheostats. Same high grade construction.
H151 200 ohm. Each.....79c
H152 400 ohm. Each.....79c

SUPERIOR RHEOSTATS

H153 6 ohm. Each.....69c
H154 20 ohm. Each.....76c
H155 30 ohm. Each.....83c
The finest rheostat. Smooth, even action. Best design, best workmanship. Supplied with attractive dial and knob. A rheostat for high grade sets.
Potentiometers to match above rheostats with dial and knob.
H156 300 ohm 98c

QUICK ACTING RHEOSTAT

H124 6 ohm. Ea....79c
H125 15 ohm. Ea...88c
H126 30 ohm. Ea...99c
Vernier adjustment at every degree of resistance. Pushing knob in turns off the filament.

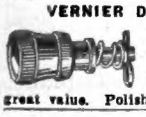
THREE INCH DIAL

H923 For 3-16 inch shaft. Each 22c
H924 For ¼ inch shaft. Each 22c
A handsome neat looking dial moulded in one piece of polished black composition. 180° scale marked 0 to 100 finely engraved in contrasting white enamel. Diameter 3 inches.

TWO INCH DIAL

H921 For 3-16 inch shaft. Each 16c
H922 For ¼ inch shaft. Each 16c
A handsome dial moulded in one piece of polished black composition. 270° scale marked 0 to 100 finely engraved in contrasting white enamel. Fine for rheostat or switch control. Diam. 2 in.

VERNIER DIAL ADJUSTER



H941 Each 19c
Easily installed at edge of dial, gives finest vernier adjustment of condenser or inductance. A great value. Polished black knob.

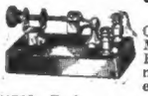
BAKELITE DIALS

H931—2 in. Diam. for 3-16 in. shaft. Each 35c
H932—2 in. Diam. for ¼ in. shaft. Each....35c
H933—3 in. Diam. for 3-16 in. shaft. Each..39c
H934—3 in. Diam. for ¼ in. shaft. Each...39c
H935—4 in. Diam. for ¼ in. shaft. Ea. 48c
Moulded in one piece of genuine bakelite in polished black finish. Finely engraved scale in contrasting white enamel. Sure grip knob that fits the fingers. Higher grade dials for good sets. Sizes match perfectly.

ENCLOSED DETECTOR

One of the finest crystal detectors on the market. supersensitive galena crystal enclosed in heavy glass shield. Quick, positive adjustment. Brass parts polished nickel finish.
H730 Each 89c

GALENA DETECTOR



Easy fine adjustment. Crystal mounted in cup. Moulded base and knob. Brass parts polished nickel finish. An unequaled value.
H732 Each 59c

GREWOL CRYSTAL DETECTOR

H742 Each $1.69

DETECTOR CRYSTALS

H736 Galena, Arlington tested piece 19c
H738 Silicon, Arlington tested, piece 19c
H735 Tested, Galena, Mounted, piece 9c
H737 Tested, Silicon, per piece..... 9c
H739 Genuine million point crystal. Ea 29c

SUPERIOR VARIABLE GRID RESISTANCE

H167 Each 80c
H168 With .00025 Condenser 95c
Eliminates hissing, clarifies signals. Capacity smoothly varied from 0 to 6 megohms by half turn of knob. Easily mounted on any panel.
H171 Freshman panel mounting variable grid leak with .00025 condenser. Each 69c
H172 Durham variable grid leak with mounting. Each 89c
H173 CRL Variable grid leak. Each $1.19

TUBULAR GRID LEAKS AND CONDENSERS

Very convenient. Permit of quick change of leaks or condensers of varying capacity. Cut shows leak mounted. Leaks and condensers have same appearance. Each part priced separately.
H849 Grid Leak. Each.....18c
Resistances—½, 1, 1½, 2, 3, 5, 7, and 10 megohms. Specify which size is wanted.

H831 Grid and Plate Condensers. Ea. 39c
Capacities—.00025, .0001, .00025, .0005 mfd. Specify which size is wanted.

Mountings. Bakelite base.
H840 Single mounting. Each.....28c
H842 Double mounting. Each.....47c
H844 Triple mounting. Each.....67c

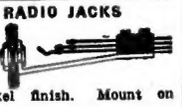
SUPERIOR INDUCTANCE SWITCH

H288 Each.....74c
Quickly and securely mounted by drilling one hole. Only knob and pointer show in front of panel. Connections can be soldered before fastening switch, making assembly much easier. Metal parts nickeled. Bakelite knob and supporting base.

STANDARD BRAND LOUD SPEAKERS AND UNITS

H610	Murdock	$4.38
H611	Rico	4.85
H613	Barawik with Baldwin unit	11.25
H615	Pathe	19.50
H616	Atlas	21.50
H612	Magnavox R3	32.50
H614	Magnavox M1	32.50
H617	Music Master	27.00
H755	Genuine Baldwin type C unit	5.35
H619	Murdock Special Unit	2.60
H618	Brandes Table Talker	8.75
H620	Baldwin Loud Speaker	22.50

SUPERIOR RADIO JACKS



Finest grade jacks. Improved design. Best materials. Phosphor bronze springs. Silver contact points. Nickel finish. Mount on panels ⅛ to ⅜ in.
H390 Open circuit. Each.....36c
H391 Closed circuit. Each.....45c
H392 Two circuit. Each.....54c
H393 Single circuit filament cont.....58c
H394 Two circuit filament cont.....74c

COMPETITOR JACKS

H387 Open circuit. Each.....27c
H388 Two circuit. Each.....35c
Well made, durable, smooth working, nickel finished frame. Well insulated.

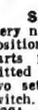
SUPERIOR RADIO PLUGS

H395 With set screws for fastening cord. Each ...35c
H397 Two-way — takes two pair any style cords. Each.....59c
Highest grade plugs. Fit any standard jacks. Polished round barrels.

SWITCH CONTACT POINTS

Brass polished nickel finish. All have ⅝ in. long size 6-32 screws and two nuts. All prices the same.
Dozen 15c Hundred $1.00
Order by Article Number.
H360 Head, ¼" diam.; ⅛" high
H362 Head, 3-16" diam.; ⅛" high
H363 Head, 3-16" diam.; 1-16" high
Solder Lugs to Fit Contact Points
Also for connecting wires to binding posts, etc.
H365 **Dozen 8c Hundred 30c**

SWITCH LEVER STOP



Brass polished nickel finish.
H386 Dozen 18c Hundred $1.05

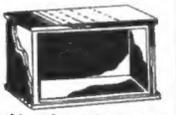
SWITCH LEVERS

Very neat polished black composition knob. Exposed metal parts polished nickel finish. Fitted with panel bushing and two set nuts. A high grade switch.
H381 1⅛" Radius. Each 15c

INDUCTANCE SWITCH

H285 Price including knob and dial..$1.29
Mounts switch points and contact lever behind panel. Only one hole needed to mount. 15 switch points, any number of which may be used. Smooth wiping contacts. Attractive tapered knob.

CABINETS



Fine looking cabinets solidly built. Elegant hand rubbed dark mahogany finish. You will be proud of your set mounted in one of these cabinets. Hinged tops. Front rabbeted to take panels. Panels not included. Prices are transportation paid.

Panel Size	Inside Dimensions High	Wide	Deep	Art. No.	Price Each
6x 7"	5½"	6½"	7"	H420	$2.15
6x10½"	5½"	10 "	7"	H422	2.65
7x10"	8½"	9½"	7"	H421	2.90
7x12"	8½"	11½"	7"	H424	3.05
7x14"	8½"	13½"	7"	H423	3.20
7x18"	8½"	17½"	7"	H426	3.45
7x21"	8½"	20½"	7"	H425	3.85
7x24"	8½"	23½"	7"	H429	4.65
9x14"	8½"	13½"	10"	H428	3.55
12x14"	11½"	13½"	10"	H430	4.65
12x21"	11½"	20½"	10"	H432	5.45

BARAWIK QUALITY HEADSETS

H770 Per Set, 2000 ohms.....$3.25
These headsets have proven on rigid tests to be one of the very best on the market. The tone quality is excellent with an unusual volume. Skilled workmen make them from only the best selected materials. The receiver cases are fine polished finish with polished black ear pieces. Fabric covered head band comfortably and quickly fitted to the head. Supplied with 5-foot cord. These sets were designed to sell for much higher prices than we ask, and at our price are a wonderful bargain. We guarantee that you will be pleased with them and agree that they are the best value by far yet offered. If they don't suit you we will cheerfully return your money.

STANDARD BRAND HEADSETS

H754 Baldwin Type C with universal jack plug $10.95
H756 Red-Head, 3000 ohm 5.75
H768 Brandes, 2000 ohm 4.90
H769 Brandes, 3000 ohm 6.75
H751 Murdock 56, 2000 ohm $3.59
H752 Murdock 56, 3000 ohm 3.95
H764 Frost, 2000 ohm 3.59
H766 Frost, 3000 ohm 4.15
H758 Western Electric 9.50

PLATE CIRCUIT "B" BATTERIES

You can make real savings on these batteries. Don't pay more. We guarantee them to equal any on the market regardless of price. Absolutely uniform. Extra long life.
H180 Signal Corps type, small size. 15 cells, 22½ volts. Each $1.10
H182 Large size, 5 taps 16½, 18, 19½, 21 and 22 volts. Each.....$1.59
H184 Variable Large Navy size, 16½x4x3 inches 5 taps, giving range from 16½ to 22½ volts in 1½ volt steps. Each...$1.95
H188 Combination Tapped 45 volts, 30 cell, 13x4x3 battery. Tapped to give 45, 22½, 21, 19½, 18 and 16½ volts. Handles both detector and amplifier tubes. Ea. $3.65

"B" BATTERY METER

H189 Each 98c
Reads 0 to 50 volts. Accurately tells you the exact condition of your B Battery. Convenient watch size. Polished nickel case with wire lead.

STORAGE "A" BATTERY

A very high grade battery made especially for radio service. Guaranteed for three years. Properly cared for will give many more years of service for filament lighting. Made of best new materials. Full capacity. The best battery buy on the market. Try one of these batteries on your set for 10 days. If at the end of that time you are not fully satisfied with the battery return it and we will refund the purchase price.
H194 6 volt, 40 ampere size. Each $10.75
H196 6 volt, 80 ampere size. Each 13.25

HOMECHARGER BATTERY CHARGING RECTIFIER

Charge your battery at home over night for a few cents. Simply connect to any 110 volt 60 cycle light socket, turn on current and rectifier does the rest automatically. Will work for years without attention. Simple connections. Gives a tapering charge which batteries should have. You can make it pay a profit charging your friends' auto batteries. Long connecting cords with pair of battery clips.
H201 For 6 volt battery.....$12.95
H203 For 12 volt battery..... 12.95

HYDROMETER

H190 Each 48c
Accurately tells you the condition of your storage battery. Helps you keep your battery in better condition.

BATTERY CLIPS

H198 Two for 28c
Clip onto storage battery terminals, lead coated. Make positive non-corrosive contact at all times.

WIRE CONNECTING CLIPS

H199 Per dozen 30c
Small connecting clips for quickly fastening leads on to binding posts, etc. Handy and useful. Every radioist should have at least a dozen.

RADIO "BAKELITE" PANELS

Notice our very low prices on this fine quality material. Others ask as much for hard rubber panels which are worth much less. We supply genuine Bakelite, Condensite Celeron or Formica, all of which are materials with practically identical mechanical, chemical and electrical properties. Machines well without chipping. Won't warp. Waterproof. Highest mechanical and dielectric strength. Attractive natural polished black finish which can be sanded and oiled.

Panel Size Inches	⅛" thick Art. No.	Price	3-16" thick Art. No.	Price	¼" thick Art. No.	Price
6x 7	H450	$0.57	H460	$0.8'	H470	$1.15
6x10½	H451	.86	H461	1.27	H471	1.73
7x14	H458	1.38	H468	2.07	H478	2.76
7x18	H453	1.78	H463	2.65	H473	3.56
7x21	H457	2.05	H467	3.05	H477	5.10
7x24	H459	2.42	H469	3.56		
9x14	H454	1.65	H464	2.65	H474	3.56
12x14	H455	2.42	H465	3.56	H475	4.78
12x21	H456	3.62	H466	5.35	H476	7.13

RUBBER COMPOUND PANELS

Made of a special compound having a rubber base. Equal in appearance and in all essential points to any other class of panels. Fine smooth polished finish. Can be drilled or cut without chipping. Guaranteed not to warp and to be a perfect insulator for radio use. Smooth, clean edges. Thickness 3/16 inch. Size given is in inches.

H481	7x10...$ .88	H484	7x18...	$1.60
H482	7x12... 1.05	H485	7x21...	1.85
H483	7x14... 1.22	H486	7x24...	2.10

THE BARAWIK CO. Chicago's Original Radio Supply House Beware of Imitators 102 South Canal St., Chicago, Ill.

Digitized by Google Original from UNIVERSITY OF CHICAGO

Master Electricity By Actual Practice

The only way you can become an expert is by doing the very work under competent instructors, which you will be called upon to do later on. In other words, *learn by doing*. That is the method of the New York Electrical School.

Five minutes of actual practice properly directed is worth more to a man than years and years of book study. Indeed, Actual Practice is the only training of value, and graduates of New York Electrical School have proved themselves to be the only men that are fully qualified to satisfy EVERY demand of the Electrical Profession.

The Only Institution of the Kind in America

At this "Learn by Doing" School a man acquires the art of Electrical Drafting; the best business methods and experience in Electrical Contracting, together with the skill to install, operate and maintain all systems for producing, transmitting and using electricity. A school for Old and Young. Individual instruction.

Over 8,000 Graduates are Successful Men in the Electrical World

No previous knowledge of electricity, mechanics or mathematics is necessary to take this electrical course. You can begin the course now and by steady application prepare yourself in a short time. You will be taught by practical electrical experts with actual apparatus, under actual conditions.

The N. Y. E. S. gives a special Automobile Ignition Course as an advanced training for Auto Mechanics, Garage Men and Car Owners. The course covers completely all Systems of Ignition, Starters, Lighting and other electrical equipment on automobiles, motor boats, airplanes, etc.

Let us explain our complete courses to you in person. ***If you can't call, send now for*** *64-page book—it's FREE* ***to you.***

New York Electrical School
29 W. 17th St., New York, N. Y.

Please send FREE and without obligation to me your 64-page book.

..... NAME

..... STREET

.....CITY .....STATE

New York Electrical School

29 West 17th Street, New York

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Volume XI
Whole No. 129

Science and Invention

H. GERNSBACK, EDITOR AND PUBLISHER
H. WINFIELD SECOR, ASSOCIATE EDITOR
T. O'CONOR SLOANE, Ph.D., ASSOCIATE EDITOR
Editorial and General Offices, - - - 53 Park Place, New York

JANUARY
1924
No. 9

"Those Who Refuse to Go Beyond Fact Rarely Get As Far As Fact"--HUXLEY

Evolution

By H. GERNSBACK

MR. H. GERNSBACK,
New York City.
Dear Sir:

The pleasure which I derive from your editorials can never be determined. They are the best I have ever read, yet there is one thing which I have often wondered about, and which I have never seen treated on your editorial page of SCIENCE AND INVENTION. It is man's evolution. Many of the science magazines have completely over-stressed the question.

I am sure your readers are earnestly looking for your opinion concerning this subject. It would be very much appreciated if we could read your views of the above in the next issue of SCIENCE AND INVENTION.

Thanking you I am
Very truly yours,
(S) *FRANCIS L. WADSWORTH, JR.*
Radio Editor of Macon County School Review,
Tuskegee, Alabama.

I BELIEVE
¶ THAT you can't believe everything you see with your own eyes.

The writer must thank the sender of the above for his letter. The writer had no idea that so much attention was paid to his editorials. He has been writing them for years as a sort of hobby, which was hard to abandon, but it is gratifying to see that there are really people who read them.

The reason the writer has never written an editorial on man's evolution is, that the subject is so vast, that it is almost impossible to treat it successfully in a short editorial. One of the best works on man's evolution that the writer ever came across is H. G. Wells' "Outline of History," with which the writer is very much in sympathy. In the main, it expresses the writer's ideas. The following, however, will give a few of his own observations on man's evolution at random.

Life began on this planet the minute the earth had formed a solid crust and had cooled off so that water would not boil on its surface. At that time evolution on this planet commenced. Just how life actually began at first it is impossible to tell now. The reason is that we do not know now what life really is. But it seems probable that the first living creatures came from the muck and slime collected by sea waters on beaches. In other words, life first came out of the depths of the ocean. This seems pretty well established today. Man is a descendant of fish. Man's spine and the spine of a fish are in principle the same. Even man's hair can be directly traced to fish scales.

Of course, all this evolution is extremely slow. From the first fish to the first prehistoric man, you will find that the time must be measured in millions, if not billions of years. Evolution on this planet in general is very slow and very gradual. It takes tens of thousands of years before a change can even be detected. The Egyptian mummies that we find today, although perhaps five or six thousand years old, are practically the same anatomically as ourselves. In other words, a span of 5,000 years in man's evolution means nothing at all. How could it be otherwise when only 58 generations have elapsed since Christ was born nineteen hundred and twenty-three years ago, and only 178 generations have elapsed since the earliest Biblical times, figuring the average life at one-third of a century. Every breeder of horses and dogs knows that the process of evolution is extremely slow. Many generations must be passed before even the slightest change is possible.

I BELIEVE
¶ THAT there is nothing more mind ennobling in the whole world than astronomy.

Before man had acquired speech, it is very probable that he roamed the primeval forests much as wild animals do today. He probably was entirely covered with hair and there is no question that in many respects he resembled a large monkey. This does not mean that man has descended from monkey or that monkey has descended from man. During the process of evolution there probably came a time when a so-called "split" arrived, of which the human race is one branch and of which the monkeys are another branch; but that both descended from the same common ancestors there is no reason for doubt. *All* of our ancestors originally came from the sea.

I BELIEVE
¶ THAT most successful inventors are made — not born.

Our abode then was probably the primeval forests. That the earliest man dwelt in trees, there is today no doubt. Down to our present day, the instincts still lead back to the forests. Nearly every human being still dreams of falling through space. This can be traced directly back to the time when we were still living in trees and when one of the greatest dangers to the race was the falling from a tree into the fangs of some prowling beast.

Nearly every man, particularly those who go hunting, know the strange feeling that comes to them when followed in the dark. The hair of the back of the neck begins to bristle in a disagreeable manner. This, even today, is common in many animals such as monkeys, dogs, etc.

Even the panic-stampede of human beings can be traced directly to the forests. A man when alone has an entirely different psychology than a man in a crowd. The collective stampede of the human race is an exact counterpart of the animal stampede as it exists with many animals.

One surprising thing that the writer has always been concerned with is: How many times has a "human" race been evolved during the past millions of years. By that is meant animals—not necessarily resembling man—that could talk and REASON as human beings do. But there is a possibility that such a race lived on this planet, having long been supplanted by other species under Nature's own law of the "survival of the fittest."

Of course, it might be said that under this classification, such highly developed insects, as for instance the ants and the bees, would come. Many entomologists are of the opinion that both of these insect classes really do reason, which the writer does not deny. But it might be said that there can be several classes of reasoning. For instance, it may be doubted if either the ant or the bee knows anything of astronomy, of scientific research work, of chemistry, etc. In any event, both of these classes of insects are much older than the human race, but neither of them seem to have made use of the planet's treasures. So far, only the human race seems to have had this "gift."

THE GOLDEN AGE OF SCIENCE

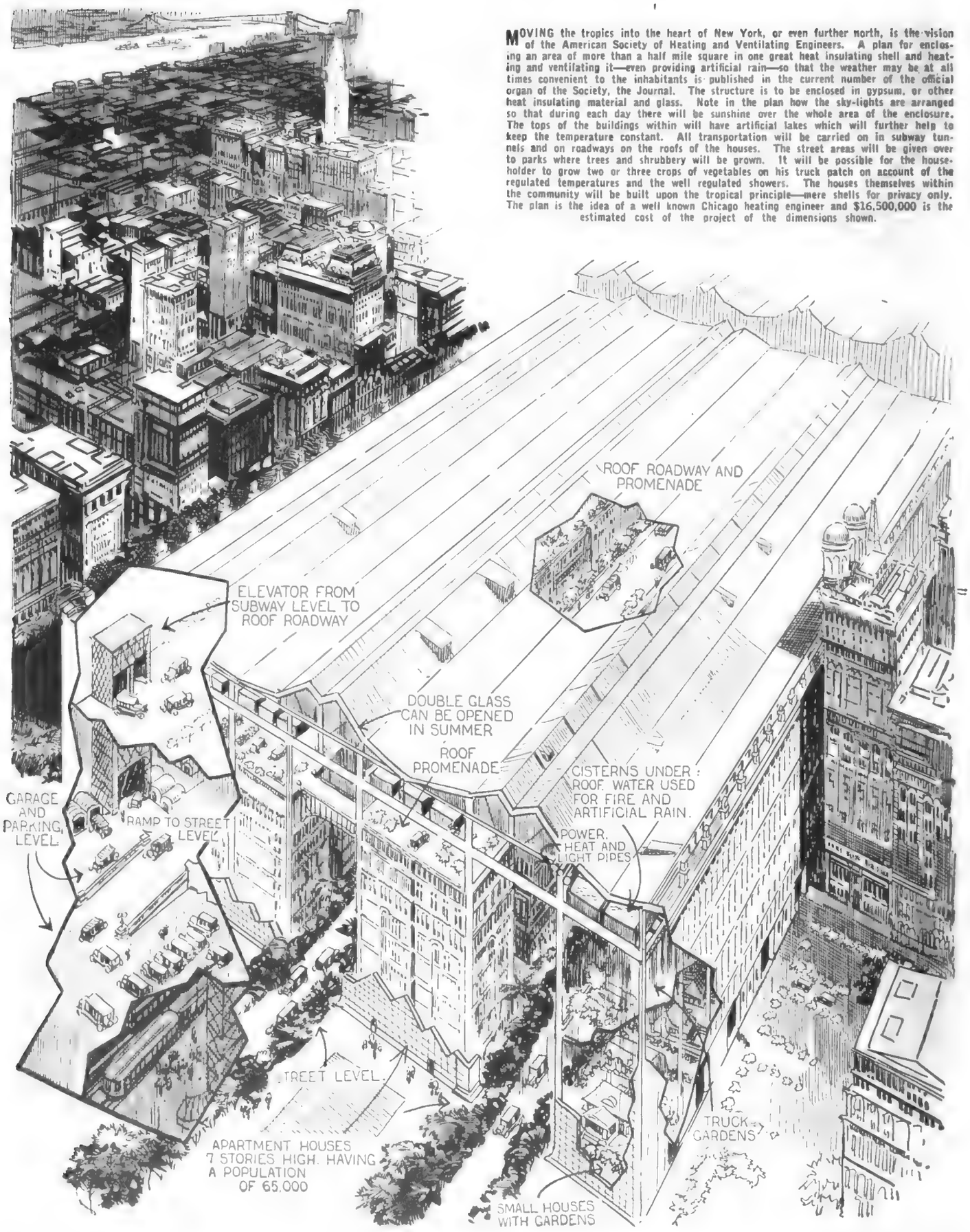
is now symbolized by the golden cover of SCIENCE & INVENTION. LOOK FOR THE GOLD COVER every month!

Digitized by Google
Original from UNIVERSITY OF CHICAGO

A Glass Enclosed City

Glass Enclosed Community to Have Artificial Heat and Rain.

MOVING the tropics into the heart of New York, or even further north, is the vision of the American Society of Heating and Ventilating Engineers. A plan for enclosing an area of more than a half mile square in one great heat insulating shell and heating and ventilating it—even providing artificial rain—so that the weather may be at all times convenient to the inhabitants is published in the current number of the official organ of the Society, the Journal. The structure is to be enclosed in gypsum, or other heat insulating material and glass. Note in the plan how the sky-lights are arranged so that during each day there will be sunshine over the whole area of the enclosure. The tops of the buildings within will have artificial lakes which will further help to keep the temperature constant. All transportation will be carried on in subway tunnels and on roadways on the roofs of the houses. The street areas will be given over to parks where trees and shrubbery will be grown. It will be possible for the householder to grow two or three crops of vegetables on his truck patch on account of the regulated temperatures and the well regulated showers. The houses themselves within the community will be built upon the tropical principle—mere shells for privacy only. The plan is the idea of a well known Chicago heating engineer and $16,500,000 is the estimated cost of the project of the dimensions shown.


ROOF ROADWAY AND PROMENADE
ELEVATOR FROM SUBWAY LEVEL TO ROOF ROADWAY
DOUBLE GLASS CAN BE OPENED IN SUMMER
ROOF PROMENADE
CISTERNS UNDER ROOF. WATER USED FOR FIRE AND ARTIFICIAL RAIN.
POWER, HEAT AND LIGHT PIPES
GARAGE AND PARKING LEVEL
RAMP TO STREET LEVEL
STREET LEVEL
APARTMENT HOUSES 7 STORIES HIGH. HAVING A POPULATION OF 65,000
TRUCK GARDENS
SMALL HOUSES WITH GARDENS

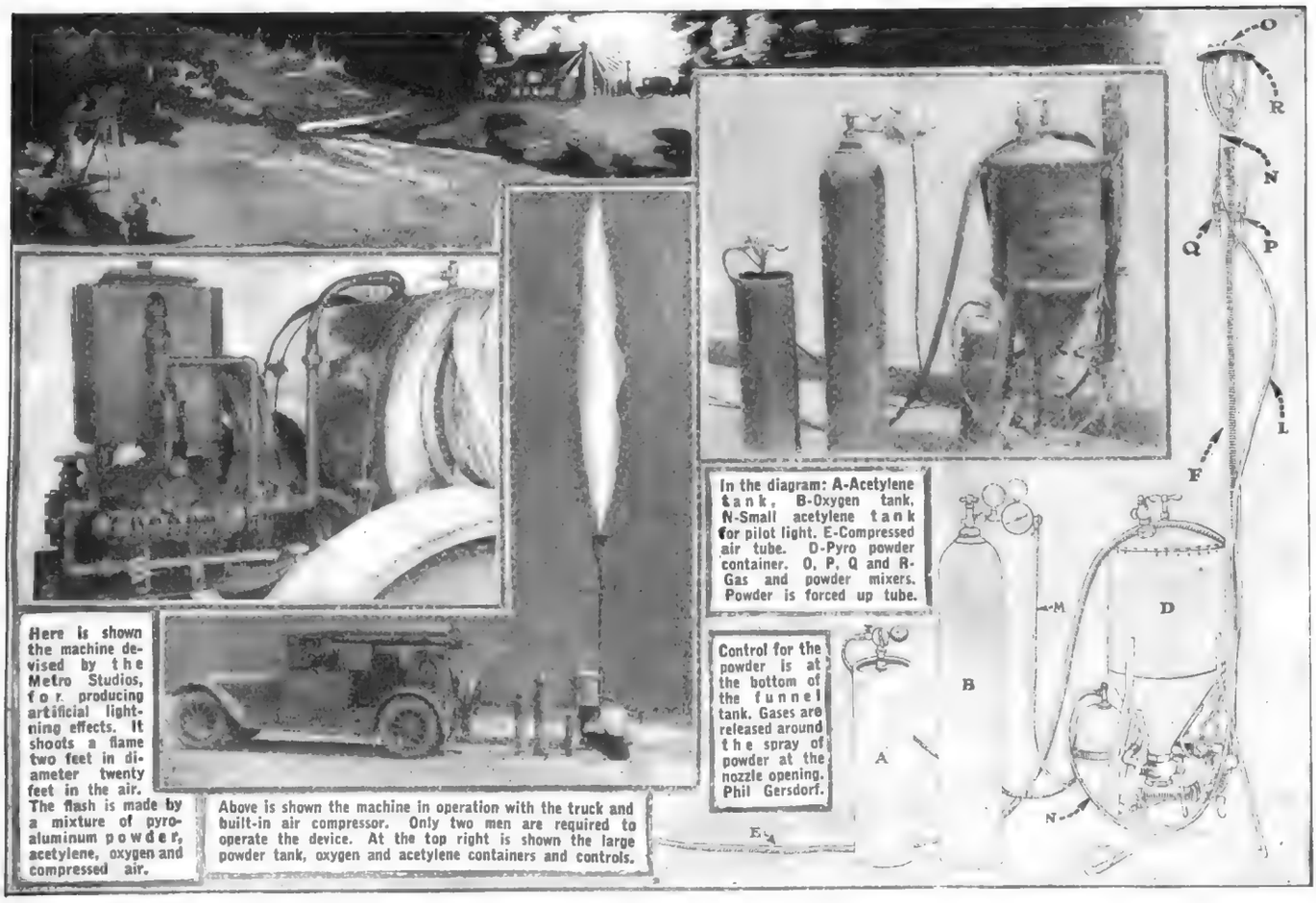
Drawn by L. Biederman.

©—1923—By Science & Invention

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Movies Manufacture Own Lightning

Machine Shoots Two-Foot Flame Twenty Feet In Air.



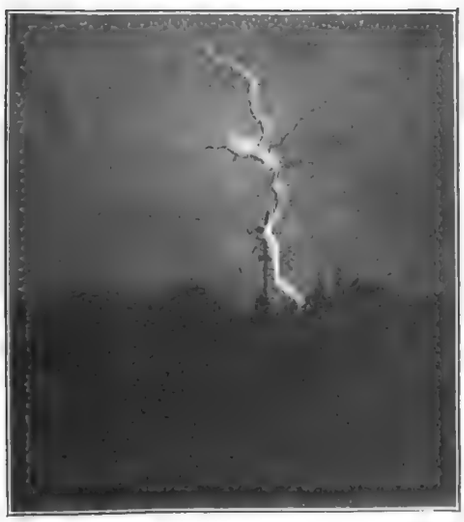
Here is shown the machine devised by the Metro Studios, for producing artificial lightning effects. It shoots a flame two feet in diameter twenty feet in the air. The flash is made by a mixture of pyro-aluminum powder, acetylene, oxygen and compressed air.

Above is shown the machine in operation with the truck and built-in air compressor. Only two men are required to operate the device. At the top right is shown the large powder tank, oxygen and acetylene containers and controls.

In the diagram: A-Acetylene tank, B-Oxygen tank, N-Small acetylene tank for pilot light. E-Compressed air tube. D-Pyro powder container. O, P, Q and R-Gas and powder mixers. Powder is forced up tube.

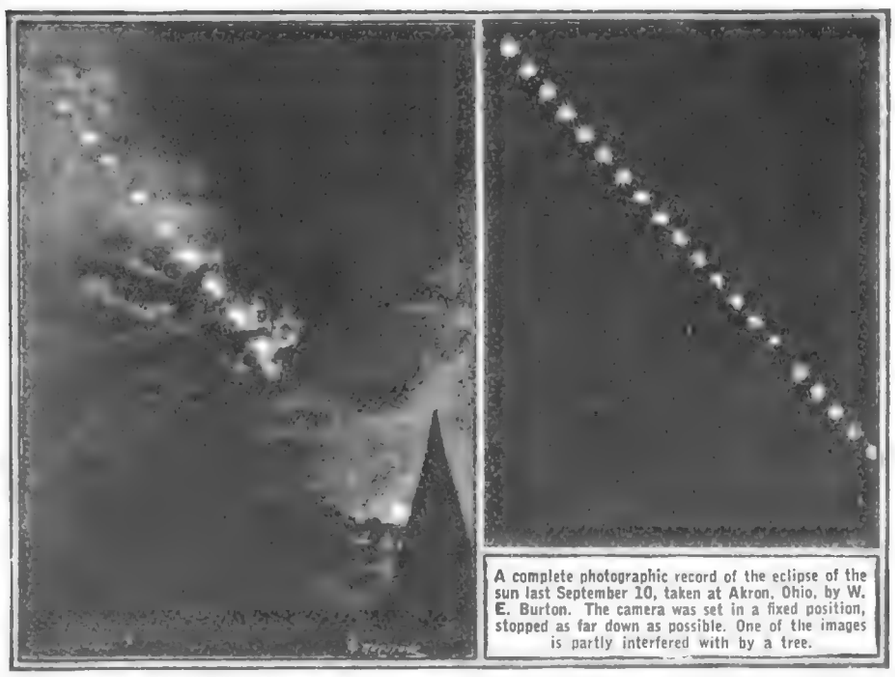
Control for the powder is at the bottom of the funnel tank. Gases are released around the spray of powder at the nozzle opening. Phil Gersdorf.

Black Lightning



In spite of the fact that practically no explanation which really explains the nature of the so-called black lightning has been brought forward there seems to be no end of evidence as to its actual existence. Above is a photo of the phenomenon taken recently at Spokane, Washington, by T. L. Walker. The original photo was taken on a five by nine plate and in a perfectly ordinary way. It was taken at night with a small exposure and the lightning furnished the only illumination for the plate. The smaller reproduction shown here is a reduction from the original plate. Some scientists have gone to great length to prove that this phenomenon is the work of some defect in the photographic process or due to some peculiarity in the plate or in the camera

Photographs of Eclipse



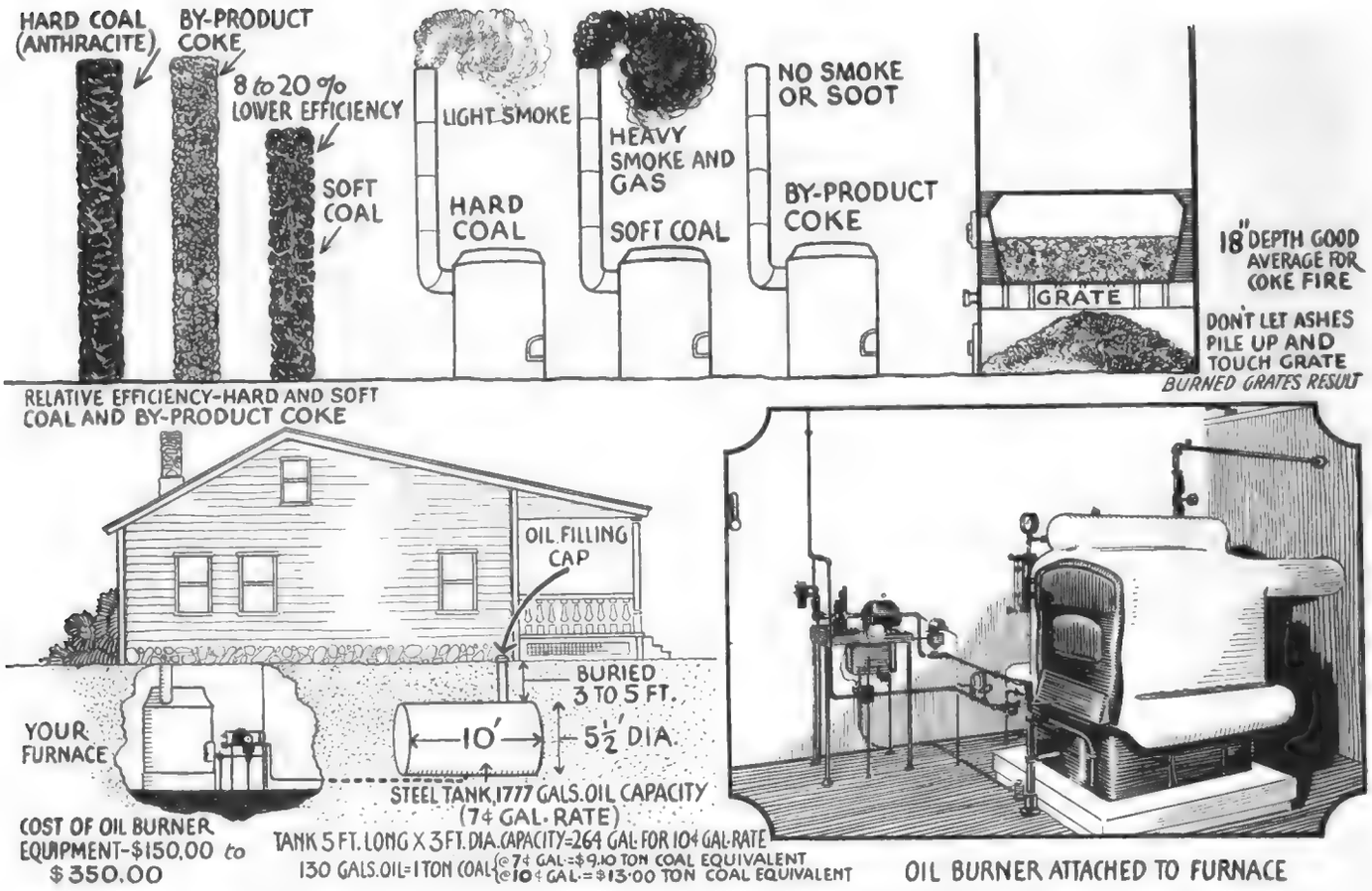
A complete photographic record of the eclipse of the sun last September 10, taken at Akron, Ohio, by W. E. Burton. The camera was set in a fixed position, stopped as far down as possible. One of the images is partly interfered with by a tree.

At the left above is shown another composite photograph of the eclipse that was obscured for a period of thirty minutes by a passing cloud. This series was made at Scranton, Penn. The cloud moved in the way after nine, five-minute exposures had been made. The exposures began at 4:10 P. M. The last one was made at 5:25 P. M.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Coke and Oil As Coal Substitutes

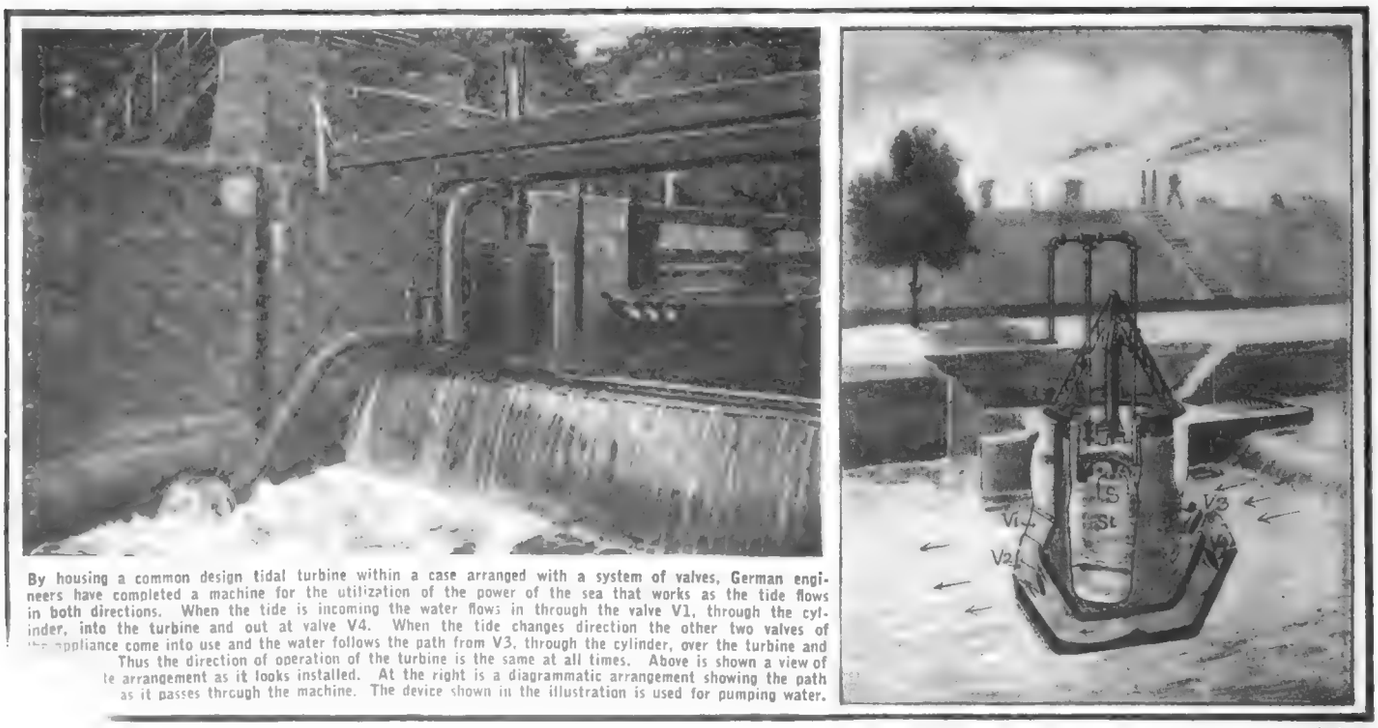
By-Product Coke and Oil More Efficient Than Coal.


HARD COAL (ANTHRACITE)
BY-PRODUCT COKE
8 to 20 % LOWER EFFICIENCY
SOFT COAL
LIGHT SMOKE
HARD COAL
HEAVY SMOKE AND GAS
SOFT COAL
NO SMOKE OR SOOT
BY-PRODUCT COKE
GRATE
18" DEPTH GOOD AVERAGE FOR COKE FIRE
DON'T LET ASHES PILE UP AND TOUCH GRATE
BURNED GRATES RESULT
RELATIVE EFFICIENCY-HARD AND SOFT COAL AND BY-PRODUCT COKE
OIL FILLING CAP
BURIED 3 TO 5 FT.
YOUR FURNACE
10'
5½' DIA.
STEEL TANK, 1777 GALS. OIL CAPACITY (7¢ GAL. RATE)
TANK 5 FT. LONG X 3 FT. DIA. CAPACITY=264 GAL. FOR 10¢ GAL. RATE
130 GALS. OIL=1 TON COAL @ 7¢ GAL.=$9.10 TON COAL EQUIVALENT @ 10¢ GAL.=$13.00 TON COAL EQUIVALENT
COST OF OIL BURNER EQUIPMENT-$150.00 to $350.00
OIL BURNER ATTACHED TO FURNACE

With the ever-increasing difficulties connected with burning coal and the attendant dirtiness, the U. S. Bureau of Mines, after a full investigation state that it is not only more economical but cleaner and easier to fire coke and oil in homes and small buildings than coal. Their tests show that coke burns with the efficiency of anthracite coal (between 10 and 20 per cent more than bituminous). Their method suggested to burn the by-product coke is shown in the upper right corner. Careful regulation of the draft is necessary. In burning oil, the main problem is that of securing a tank large enough to get the cheapest rate on the fuel delivered. Details are shown above.

TURBINE-LIKE MACHINE FOR TIDE POWER

BY DR. H. BECHER.

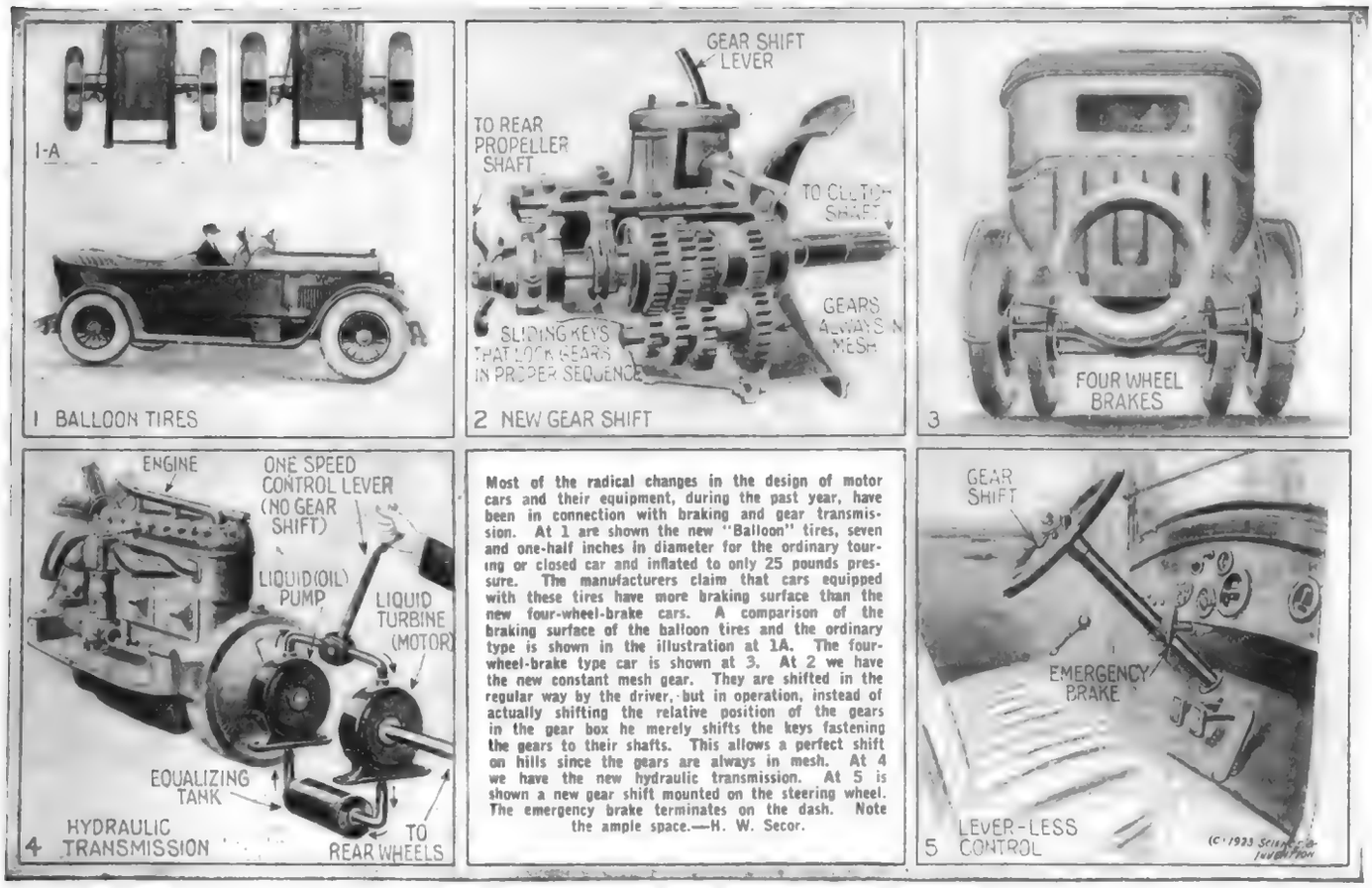


By housing a common design tidal turbine within a case arranged with a system of valves, German engineers have completed a machine for the utilization of the power of the sea that works as the tide flows in both directions. When the tide is incoming the water flows in through the valve V1, through the cylinder, into the turbine and out at valve V4. When the tide changes direction the other two valves of the appliance come into use and the water follows the path from V3, through the cylinder, over the turbine and Thus the direction of operation of the turbine is the same at all times. Above is shown a view of le arrangement as it looks installed. At the right is a diagrammatic arrangement showing the path as it passes through the machine. The device shown in the illustration is used for pumping water.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

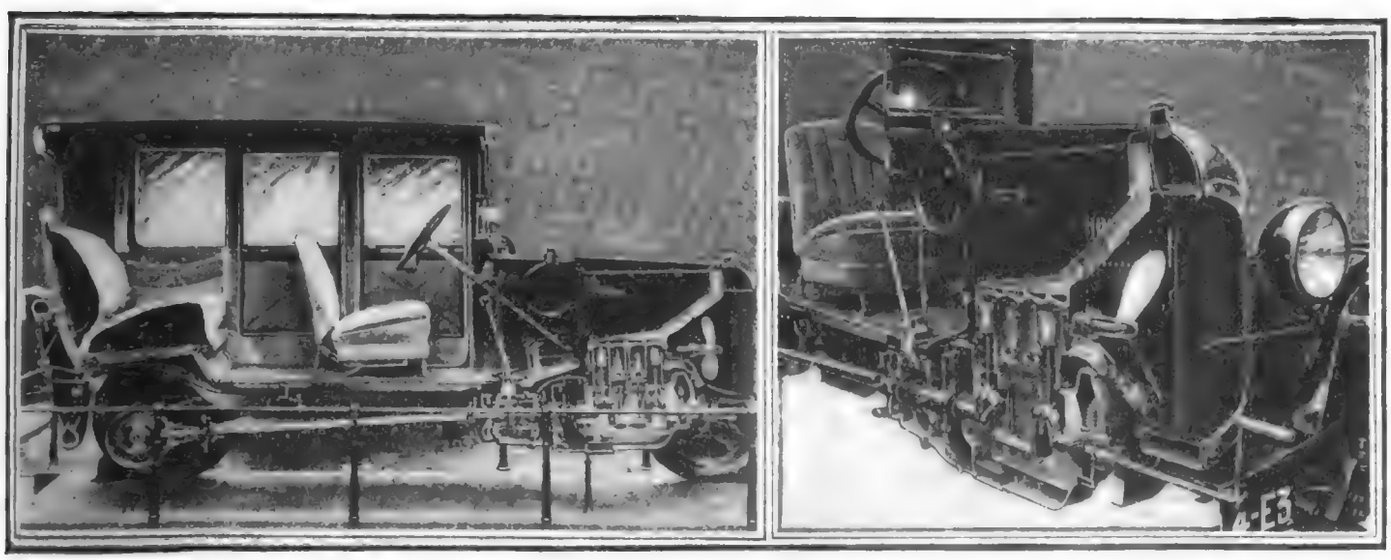
Automotive Improvements of the Year

Recent Advances Shown at New York Auto Show.



Most of the radical changes in the design of motor cars and their equipment, during the past year, have been in connection with braking and gear transmission. At 1 are shown the new "Balloon" tires, seven and one-half inches in diameter for the ordinary touring or closed car and inflated to only 25 pounds pressure. The manufacturers claim that cars equipped with these tires have more braking surface than the new four-wheel-brake cars. A comparison of the braking surface of the balloon tires and the ordinary type is shown in the illustration at 1A. The four-wheel-brake type car is shown at 3. At 2 we have the new constant mesh gear. They are shifted in the regular way by the driver, but in operation, instead of actually shifting the relative position of the gears in the gear box he merely shifts the keys fastening the gears to their shafts. This allows a perfect shift on hills since the gears are always in mesh. At 4 we have the new hydraulic transmission. At 5 is shown a new gear shift mounted on the steering wheel. The emergency brake terminates on the dash. Note the ample space.—H. W. Secor.

DEMONSTRATION CAR "CUT IN HALF"



At the recent Paris Automobile Show an enterprising manufacturer, in order to show his clients exactly how his wares are made and what they are made of, exhibited to view a full sized car cut completely in half. The car is shown above. Note that every part can be plainly seen. A good hint to American car exhibitors.

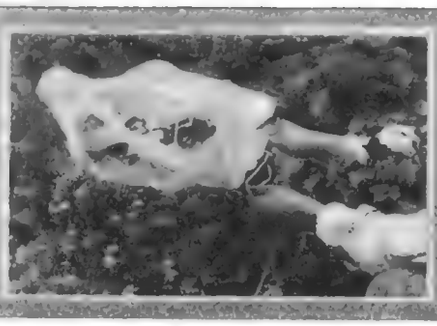
THE FIRST PRIZE WINNERS IN OUR $1,000 CONTEST

are announced in this issue! Do not fail to read the list on page 856. Each month for the coming year this series of prizes will be given for the best articles appearing in SCIENCE AND INVENTION. And nearly every article published will receive one of them. The competition is open to everyone. It is only necessary for contestants to submit their ideas with a short description accompanied by pencil sketches. Be sure to rush YOUR ARTICLE so you may win YOUR PART OF THE $1,000.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Making Butterfly Trays

One of the simplest ways in which to obtain butterflies for experimental purposes is to lure them with the aid of dried apples and valeric ether. It is only necessary to hang the fruit, on which a little of the ether has been sprinkled, on a convenient fence or twig. It will only be a short time until the collector will have as many of the insects as he can use.



In raising butterflies and moths from the eggs laid by the mother it is only necessary to find the twigs and leaves upon which the eggs are laid and then surround them with gauze or netting to protect them from their natural enemies, and to keep them from falling to the ground as soon as they are hatched. Any variety of light netting may be used.

In case it is found desirable to watch the development of the larva more closely, a small glass housing such as shown in the above photo may be constructed at a small cost by the investigator in which the development of the eggs may take place. The housing should be constructed so that the stems of the plant food supplied the insects may protrude into water.

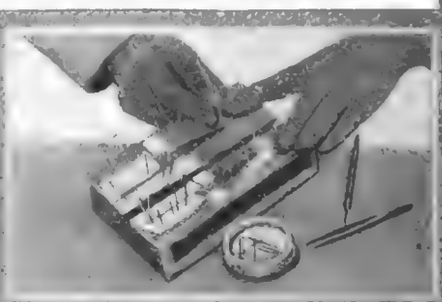
After the butterflies have reached their full development and are ready for the final mounting, they sometimes become too dry for ease in handling. If such is the case it is only necessary to put the dried insect on a small plate covered with sand as shown above and then to moisten the sand with a bit of water. It might be noted that when dry they become extremely brittle.

After the insects have been placed on the sand and it has been moistened the whole is covered with a glass container and allowed to set for a few hours. It is a dangerous practice to handle the dried butterflies since they become so brittle that the slightest touch will shatter them. For this reason if there is any sign of dryness it is safest to dampen them.

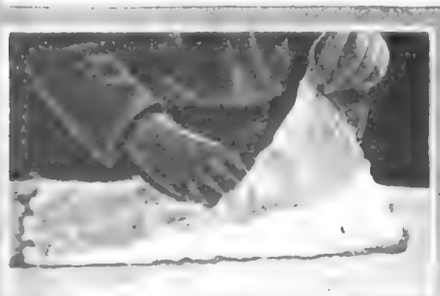
The drying board for the final process is shown in the above photo. It is made of two pieces of thin board mounted so that they take the shape of a flattened "V" with a small crack between them. The separation between the two boards should be large enough to accommodate the abdomen of the insects to be mounted. These boards may be made in any length desired.

For final drying, place the abdomen of the insect in the space between the two boards and with the aid of pins and strips of paper flatten the wings as shown above. For ease in handling the specimen it is best to thrust a pin through its abdomen, being careful not to disrupt the legs or the form of the body. By using this pin as a handle there will be many less mishaps.

After the bits of paper have brought the wings into place pin them thoroughly to the board. A very convenient tool to use in this process is made by fixing a fine needle into a wooden handle. This will help the operator to move the fragile subjects with a great deal less danger to them. A fine pair of tweezers will also be found to lend ease to many operations.



After the process of fixing the specimens to the drying boards is complete and all the pins and papers are found to be tightly fixed to the board so that they will not be removed by vibrations the whole is set away in a dry, cool place for about three weeks. At the end of this period it will be found that the specimens are thoroughly dried and are in perfect shape for display.



When making decorative backgrounds with the aid of the insects for such articles as serving trays or novelty decoration designs the well dried insects are placed on a foundation of evenly spread absorbent cotton. In order to heighten the effect the cotton may be covered with silk or other soft material. If the article to be decorated is a serving tray, the back is removed and the cotton and silk spread evenly over it.

After the foundation has been prepared, the dried specimens are removed directly from the box and with the aid of the tools described above are placed on the background in the preconceived design. If the effect is to be heightened milk-weed seeds and dried grasses and in some cases dried flowers may be used in connection with the insects. It is best to mark out the location where the specimens are to appear on the completed design so as to do away with as much handling as possible.

Here is shown the completed design after the insects, the flowers and the seeds have been put in place on the background and the whole is placed under the glass of the serving tray. An infinite variety of designs may be put into effect through this method and the complete product will have colors and a purity of design that any painter might well envy since it is made of the natural product of Nature.—Dr. Ernest Bade.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Radio Power Assured

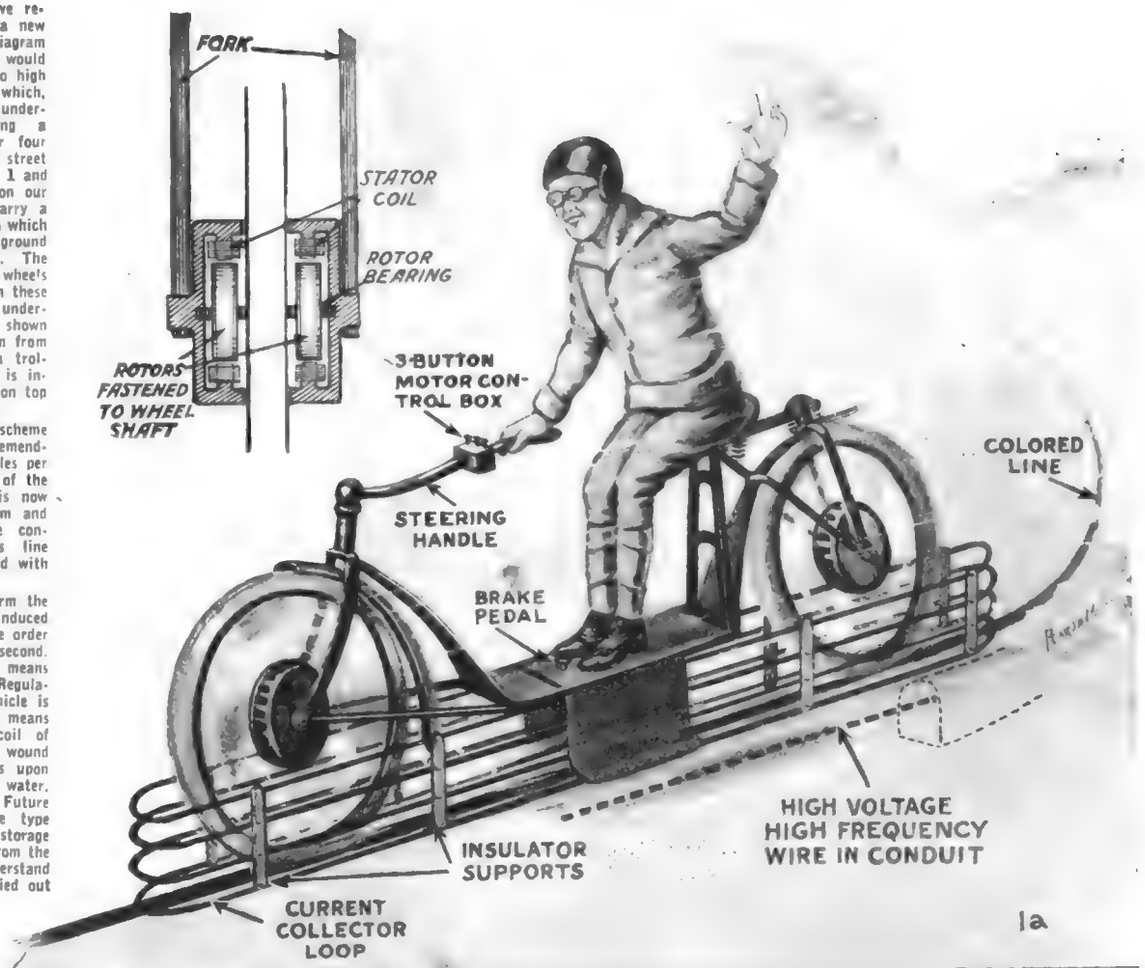
High Frequency Induction Assures Radio Power Transmission.

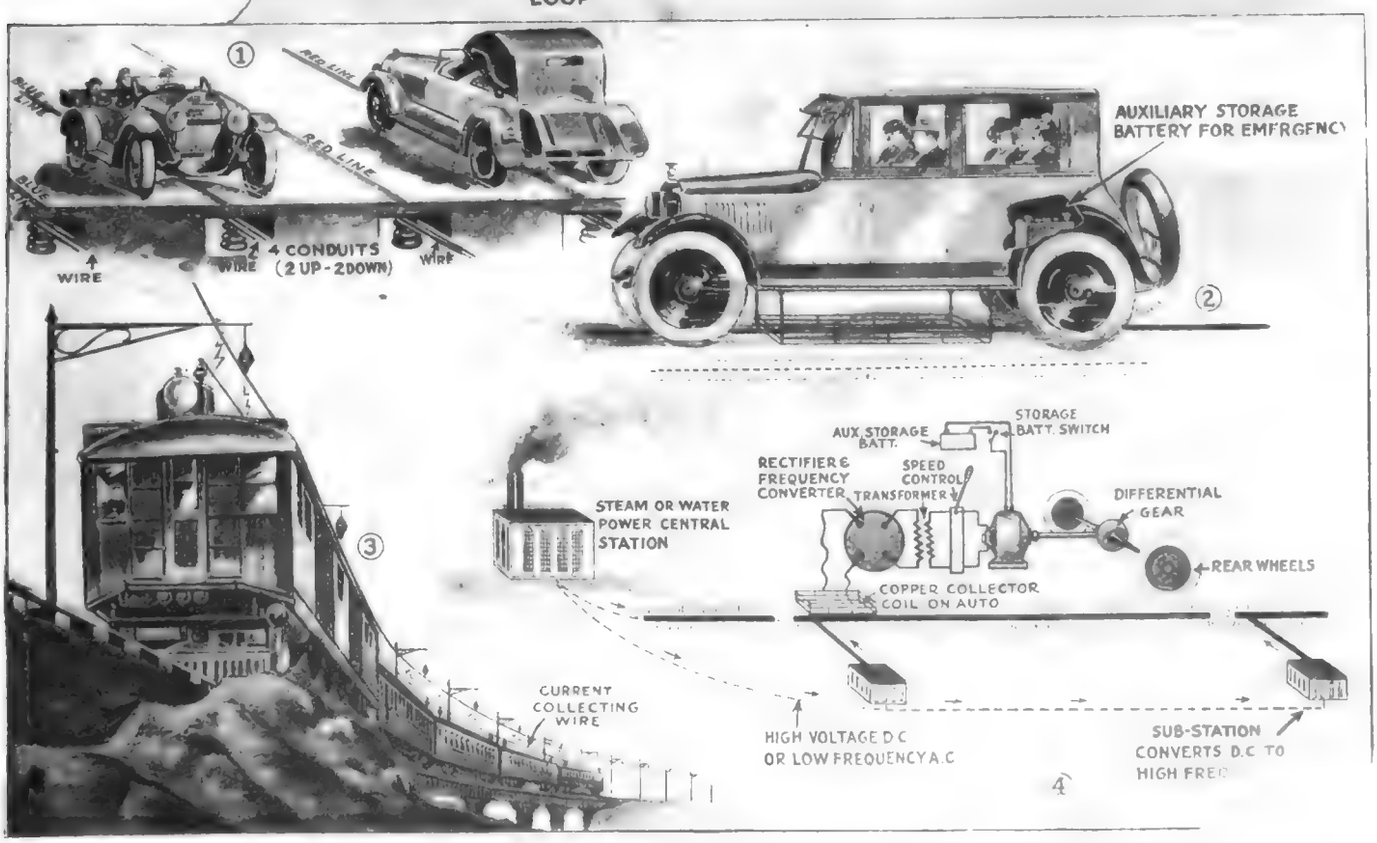
BY H. GERNSBACK

FRENCH radio engineers have recently experimented with a new sort of radio power. Our diagram 4 shows how a sub-station would convert the direct current into high frequency alternating current which, in turn, would be led to an underground conductor resembling a third rail, located three or four inches below the level of the street or road. Automobiles, (Figs. 1 and 2), or a car as illustrated on our cover and Fig. 1A, would carry a number of wire convolutions in which the energy from the underground conductor would be induced. The electric motors to drive the wheels would derive their energy from these stationary loops mounted underneath the car. On the train shown in Fig. 3, the energy is taken from the overhead wire without a trolley being used. The energy is induced into a stationary wire on top of the train.

The only draw-back to the scheme heretofore was the use of tremendous frequencies of 20,000 cycles per second but with the advent of the vacuum tube (audion), it is now possible to solve the problem and French engineers who have constructed models along this line express themselves as satisfied with the tests.

The next step is to transform the high frequency current as induced in the atuomobile coil to the order of 15 to 50 periods per second. This result is obtained by means of mercury vapor rectifiers. Regulation of the speed of the vehicle is accomplished very simply by means of a little self-induction coil of several turns of copper wire wound into a helix. This coil acts upon the current as a faucet on water, passing more or less current. Future automobiles or cars of the type shown will carry auxiliary storage batteries for traveling away from the electrified roads. We understand that this system is to be tried out in France very shortly.





Digitized by Google
Original from UNIVERSITY OF CHICAGO

The Man on the Meteor

By RAY CUMMINGS

I

I do not know where I was born. I am ignorant of the country—I do not even know on which world it was. They are trying to tell me now that I was born here on Earth. That is absurd And when you read what I have done, the extraordinary experiences I have undergone, you will realize that I am the product of some greater civilization than any you have on this Earth. I doubt even that I was born on any planet of the Solar System.

I must be at least eighty years of age now—as you on Earth measure time. I am an old man and my memory is full of strange lapses. There are blank periods in my life for which I cannot account. But you will bear with me, I am sure.

I shall tell you my history exactly as I remember it.

THE FIRST RECOLLECTION

II

The first recollection that I have was when I was a young man at the full height of my physical strength. Let us say, I was twenty, with dark hair and eyes, a slender body, but muscular and powerful. The day I have in mind is clear to my memory now—but everything that happened to me before it is a blank. I found myself lying on the ground. It was dark and there was a sky full of stars and strange flashing lights.

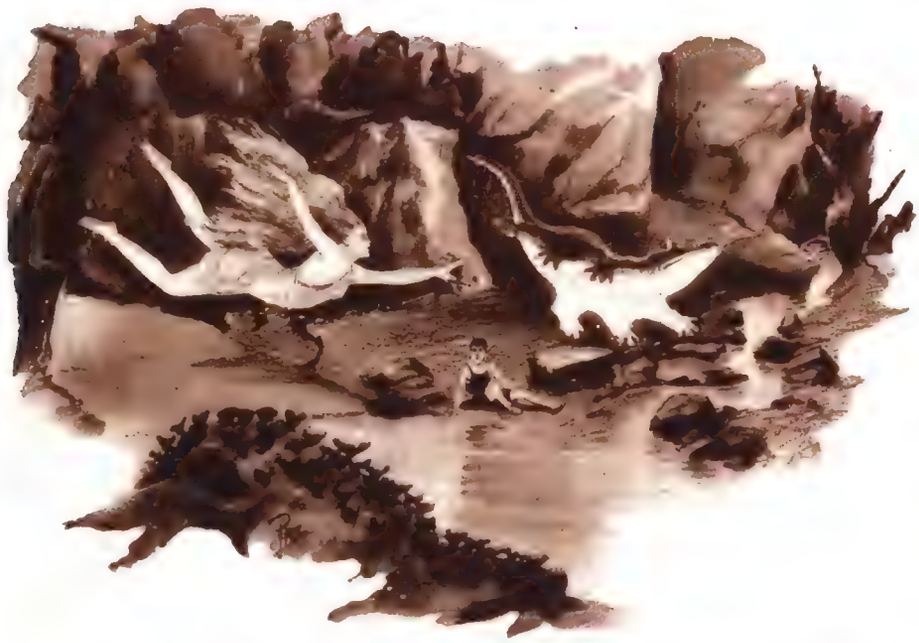
I sat up, stiff and sore, and bruised all over. I was encased in some sort of a rubber suit, with a pack on my back; my head was enclosed in a helmet of transparent, rigid material.

I felt as though I were smothering; and I tore off the helmet and flung it from me. I drank in a deep breath of the night air. It was pure and sweet, but heady. It made my senses reel like some potent wine.

I say that I sat up. That is not strictly true. I pushed my elbow against the ground, and my whole body went into the air. I floated back to a sitting posture. I was light as a feather!

The night was calm without a breath of air stirring———Lucky for me for I would have blown away had there been any wind! I sat there puzzling over my very existence. I knew nothing, not even my own name. I have since named myself Nemo. They tell me there was once a famous sea captain by that name here on Earth. I assure you that is coincidence merely, for I have no connection with your Earth other than that I am at this moment unfortunately imprisoned upon it.

This place where I found myself that starry night showed a barren landscape with only a few queerly-shaped, stunted trees. The horizon was very close to me—almost at hand, in fact—for the ground was curved with an enormous convexity.



Nona was in midair. Then, like a wasp she darted at that thing on the rock. The lizard—I shall call it that—saw her coming. It leaped, and sailed across the cave. I saw that it had webbed membrane connecting its six outstretched legs. Nona turned in the air after it, her slim body as sinuous as her waving hair.

It was indeed, as though I were clinging to the top of a ball, whirling through Space. The stars were swinging across the sky with visible movement.

I had been conscious no more than a minute when a moon swung up into view. Then another. And then, without warning, a million tiny worlds flashing silver with reflected sunlight, burst up from below the horizon and swarmed the heavens. Behind them I saw a tremendous, glowing silver sphere, with dark bands upon it—a sphere so large that as it rose it almost filled the sky.

I want no mystery in my narrative; I have no desire to puzzle you. I was on a tiny meteor—one of the myriad that swarm in circular orbits about the planet Saturn and form its rings.

No doubt you are ignorant. Most Earth-people are, I find. Let me enlighten you further.

Saturn, in position outward from the Sun, is the sixth major planet of the Solar System. Its mean distance from the Sun is 887,098,000 miles. It is a globe almost as large as Jupiter—74,163 miles in diameter, to be exact. It has, however, a trifle less than half Jupiter's density and only one-ninth the density of the Earth.

With Saturn's rings you are perhaps familiar in a general way. They are concentric, and encircle the planet like a flat hat-brim—a brim more than 37,000 miles broad. These rings are composed of billions upon billions of tiny meteors revolving about Saturn all in almost the same plane and each maintaining its separate orbit—each a tiny satellite, each glowing silver from its reflected sunlight.

And it was upon one of these tiny meteors that I found myself. Do not imagine that I knew all these facts at the moment. Far from it. I had no knowledge of any kind. My body was developed to manhood but I was ignorant of everything with only instinct and a dawning reason to guide me.

I had tossed away my transparent helmet. It left my hand and went through the air like a stone from a catapault. The last I saw of it it was sailing out over a line of trees.

My brain was still confused but I knew

I saw her eyes upon the muscles of my arms and shoulders, and her admiration pleased me. I stretched my arms for her, showed her the muscles of my legs; and looked about for some way of displaying my prowess. There were many boulders around that could be loosened. One by one I flung them into the air, sent them into Space never to return.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

that my body was over-warm. I took off the rubber garment and pack, finding myself in a white knitted affair like a bathing suit —sleeveless shirt and trunks.

THE FIRST GLIMPSE

I stood up unsteadily, and found that I had just enough weight to maintain my footing. My head was reeling, I suppose, largely because of the quality of the air.

Air, you say! Air on a meteor like that! Do you call yourself an astronomer? If so, you show your ignorance by such questioning. Air, or at least something that served my purposes of breathing, was there and that I am here alive to tell it must be your proof.

I could see perhaps a quarter of a mile. The land curved away, dropping down in every direction so that the sky at the horizon showed seemingly below the level of my feet. I was visibly on the top of the world.

Overhead those billions of tiny worlds were swarming. Sometimes fragments of star-dust would enter my atmosphere—flaming red shooting stars, burning themselves out in an instant. And behind everything hung that gigantic silver ball that was Saturn.

The whole firmament was swinging sidewise. In a few moments half of Saturn was below my horizon. The Sun rose behind me —a smaller Sun than appears to you here on Earth, but still the same yellow-red color.

It was daylight, with the Sun mounting toward the zenith so quickly in less than an hour it would be there, and my day would be half over.

I saw myself now to be standing on a slight rise of black, sandy ground. There were metallic rocks lying about, a low, scanty vegetation in patches on the ground—vegetation of a bluish color; and flimsy, stunted trees. These had broad, angular blue-white trunks with spreading tops ten feet up, and foliage that was bluish-white. Behind me was a jagged, metallic peak perhaps a hundred feet in height.

There was no water in sight, no sign of life of any kind. Quite suddenly I discovered that I was both hungry and thirsty.

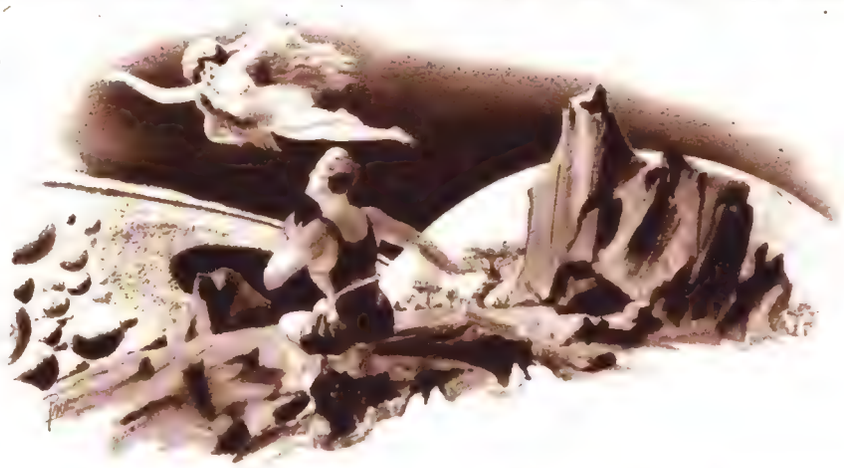
What was I to do? This world was so small I could have started walking in any direction and come back to my starting point in a very short time. Walking! It was impossible to walk! I weighed almost nothing. I stood teetering on tip-toe, straining every muscle to maintain my balance, feeling like a balloon poised ready to sail away.

I make these speculations now. At that time I had not the reasoning ability to speculate. All I knew was that I was hungry and thirsty—with a hunger and thirst that was maddening. But I was young and strong, and youth fights.

I took a step forward. Under the impulse of my gentle leg-thrust, my body rose into the air in a broad arc. I suppose I went up a hundred feet, sailing forward toward the line of trees at the horizon. I lost my balance; my arms and legs were flying. I floated gently down and landed on my face near the base of a tree!

You smile! I assure you it was not humorous to me. I stood up again, trembling with surprise and alarm. A new vista of land beyond the former horizon had opened. I saw other little jagged peaks a few hundred feet away and behind them, over that dizzying curve downward of the world, was the azure of cloudless Space.

I was frightened, and now I know it was with good reason. Had I leaped recklessly into the air I might have left my tiny world entirely—escaped from its slight gravitation sufficiently to become its satellite, or perhaps even completely to depart its vicinity and become a satellite of Saturn!



The girl took flight. Her arms struck out, and like a swimmer mounting through water she floated up to the ceiling, landing upon a ledge of rock. Through a tangle of her hair her face peered down at me. And though her eyes were frightened, there seemed an impish, mocking expression to her tremulous smile.

AN INHOSPITABLE WORLD

This tiny world upon which I found myself was inhospitable to the extreme; and yet if I had been conscious of the choice, I would not have wanted to abandon it for empty Space. Out there, worse than suffering hunger and thirst, I would not even be able to breathe. Thus, if you are of philosophical mind, you may find consolation in any unhappy plight. There is, indeed, always something worse to contemplate.

Whatever my life before this day may have been walking evidently was part of it. I know that because my instinct was to walk. I decided to weigh myself down with rocks and thus be able to maintain a footing. Futile conception! I seized a huge rock of black metallic quartz in each hand—only to find that the rocks themselves were mere feathers in my grasp! Angered I flung them into the air. They sailed away, out over the horizon. Undoubtedly they left my world never to return.

The Sun was now past the zenith. It was mid-afternoon. Shortly it would be night again.

I was clinging to the tree-trunk for support, when quite near me I saw what seemed to be the mouth of a cave. I was staring at it when a figure appeared from below. I did not move, and this thing evidently did not see me.

It was a girl, fashioned in human form like myself. She stood there cloaked in the long waving masses of her golden hair. I must have made some slight sound for after a moment she looked my way. I caught a glimpse of a beautiful oval face framed in the golden tresses, lips full and red, eyes blue, wide now with fear.

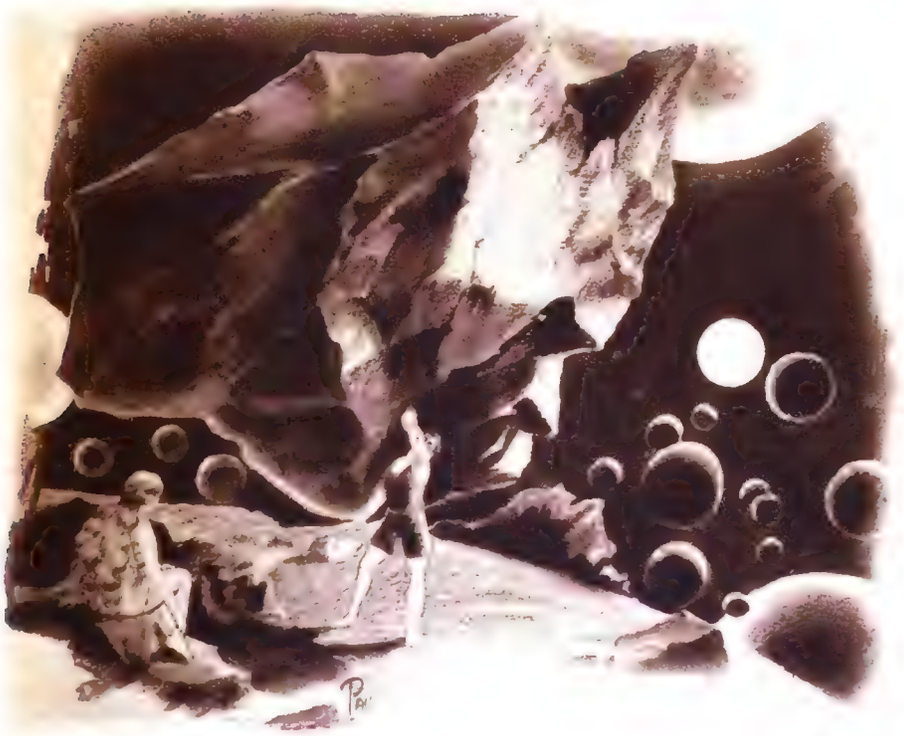
Without warning, she left the ground. She went swiftly past me, lying in the air gracefully on one side, her arms moving rhythmically. She was swimming in the air with all the grace and skill of a mermaid!

I stood spellbound. In a moment she had passed over the curve of the world and disappeared.

III

Can I say that the sight of this girl in-

(*Continued on page* 904)



Nona watched me with awe, encouraging me with little syllables of pleasure as I selected larger and larger rocks. Some I dug up and tore loose, until at last I ripped off the top and side of a hill. It was a mountain of rock. I staggered like Atlas.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Doctor Hackensaw's Secrets

By CLEMENT FEZANDIÉ

MAN has conquered the earth and the air. There still remains, however, the vast unexplored regions at the bottom of the ocean, that have so far eluded his dominion. Yet they must contain untold treasures in mineral wealth, coal and petroleum. This story of a submarine city, which seems a wild fantasy today will be a cold fact in the not distant future.

No. 25
The Secret of the Submarine City

Five minutes later the hydroplane had alighted on the surface of the ocean. Then it came to a complete stop, and a large yawning metal mouth came up out of the depths of the water and closed over it. Then it was dragged down into the ocean by means of a cable. Again there was a halt, followed by a click. "We are now in one of the receiving compartments," explained Doctor Hackensaw.

"SILAS," said Doctor Hackensaw, impressively, "I'm going to initiate you today into one of my greatest secrets—one that I have so far revealed only to those whose co-operation was necessary to carry out my plans. Silas, I am a king!"

"What!" cried the reporter, gazing at the doctor in amazement, and wondering if he had suddenly gone mad. "What did you say?"

"I said I was a king, and it is true. I am the supreme ruler of a large country—in fact I am really monarch of a domain larger than all the other kingdoms on earth put together."

"What in the name of the Seven Wonders do you mean?" asked Silas, perplexed. "Have you discovered a new continent in the Polar regions?"

"No," replied the doctor, "but I have found the means of conquering and bringing under my dominion immense unexplored regions in the ocean's depths. For years it has seemed to me foolish that man, overcrowded as he is on land, should allow the enormous tracts under water to remain unused. Do you realize, Silas, that the ocean covers far more land than all our four continents put together? It is this land that I have sought to make use of—these submerged tracts that so far have been allowed to remain idle, and that are yet capable of producing immense wealth, and of supporting a population greater than that now in existence. I have no competitors. My secret has been well kept, and I am absolute monarch of my own dominions. I make my own laws and I enforce them myself."

Silas Rockett looked puzzled. "Please explain yourself, doctor," said he. "I gather [illegible]ur idea in a vague way; but not very [illegible]rly. I suppose you have explored a [illegible]ion of the ocean's depths with submar- but how you can make any real use of this submerged land is more than I can fathom. The only thing I see that might be made useful are the fish."

"The fish, of course," returned Doctor Hackensaw, "are of great importance—I have my submarine fisheries and my submarine flocks if I may so call the immense schools of fish and marine animals that I keep penned up. The returns are highly profitable. I learn the fishes' habit and their habitats. I place immense traps at the proper places, bait them carefully and secure thouands of tons of fish with very little trouble. My canning factories run night and day. The fish are cleaned, cooked and packed by machinery, while absolutely fresh, and so have a flavor unequalled by the ordinary commercial grades."

"You have flocks of fish, too?"

SUBMARINE FARMS

"Yes, domestic herds. I hatch fish from the spawn and keep them penned in suitable places. Then, too, I have my submarine farms. You probably know that many submarine animal and vegetable growths have a real commercial value. Iodine and bromine exist in quantities in certain sea weeds and can be extracted with profit. Then I have whole acres planted with sponges of the finest quality—my oyster farms cover miles of surface and I even raise the pearl oysters and can produce pearls of the largest size and most wonderful lustre. You see, I have scoured the world to secure the best stock."

"But who attends to these submarine farms?"

"I have no lack of help. My submarine cities have a large population—not only self-supporting but every member certain of becoming wealthy in the course of a very few years."

"Submarine cities?" cried Silas, more and more perplexed. Am I to understand that you have found means of enabling men to live and work in the ocean depths, and that you have found men *willing* to so live?"

"Yes to both questions, Silas. Yes, I have found means of enabling men to live indefinitely under water in perfect comfort, and I have had no trouble in finding men and women willing to work for me. Unfortunately there is still a great deal of misery in the world, and men and women gladly come to me to escape from it. Then there are enthusiastic young people in search of adventure, and they form the elite of my workers. The inducements I offer are great—for I guarantee to all my workers who remain a few years with me, a comfortable pension for the rest of their lives. But, if you are to understand the matter, I would better begin my story at the beginning—What first gave me my idea of a submarine city, was the study of the gasoline problem."

HOW THE DOCTOR STARTED

"Gasoline?" echoed Silas Rockett.

"Yes. With the increasing use of gasoline fuel—oil for automobiles, aeroplanes and ships the supply of petroleum is certain very soon to become inadequate. The conse-

"Here are perfect specimens of all kinds of marine plants and animals, specimens such as you will not find in any museum on earth, for my men go out in diving suits and select only the finest specimens. My workers are free to move about as they use my artificial gills to furnish them air for breathing. Then here are relics from sunken ships. These coins and jewels came from a Roman galley that sank here hundreds of years ago, and was deeply imbedded in the silt. We come across very curious things here."

Digitized by Google
Original from UNIVERSITY OF CHICAGO

quence will be a great rise in the price of gasoline and the need of some substitute. During the World War a number of substitutes were tried with more or less success. Alcohol gives good results and can be made in large quantities. Hydrogen gas was tried, the automobile carrying a balloon of this gas. But the scheme was not found very practical. Liquified hydrogen in tanks might answer better. Electricity will some day supersede gasoline, but not for some time yet. I resolved to turn my attention first to increasing the available supply of gasoline. Gasoline, as you know, is made from petroleum, and the petroleum is found deep under ground. In fact, petroleum is a by-product in the natural formation of coal. The liquid sinks from the coal-beds deep into the ground, forming underground pools. These are often under pressure, and when tapped will spout up above ground like artesian wells.

"Such being the case, and England possessing very rich coal mines, how was it that England had no oil wells? Petroleum must exist in Great Britain in large quantities—why was it not made use of? I found the answer in a London Museum, where I was shown samples of petroleum obtained by borings made in different parts of England. But this petroleum, probably owing to the chalky nature of the soil, was deep under ground, and could not be profitably utilized at present.

OIL BENEATH THE SEA

"I consulted several distinguished geologists, carefully studied the geological maps, and became convinced that there must exist large deposits of petroleum below the bottom of the North Sea. The question then arose as to how to dig an oil well under water. The answer was obvious. We must sink one or more caissons and work from these. There was nothing new in the method—it is used daily in building bridges.

"I began by sinking two caissons and joined these together by a tunnel which I excavated deep under the sea bottom. This tunnel was gradually enlarged in spots to form large chambers. One of these served for the drilling operations and the others formed store-rooms and sleeping rooms.

"The great trouble was to keep matters secret. To achieve this, I bought an English power plant. Conducted the electrical power to the work by cables. The air supply is obtained from above by means of extensible conduits. A ship of my own on watch informs me of the approach of strange vessels and my air-pipes are then pulled down below the surface, and compressed air, stored in reservoirs, is used until the stranger has passed. I obtained my water supply, as on shipboard, by distilling the sea-water. I expect soon, however, to obtain an ample supply of fresh water by means of artesian wells. But what's the use of talking! You have a month's vacation. I am sailing for England tomorrow. Come along with me for a visit to my submarine city, and I promise you that you will be well repaid for your trouble."

. . . . . .

And that is how, some days later, Silas Rockett found himself with Doctor Hackensaw in England, about to embark in one of the doctor's hydro-aeroplanes for a visit to the secret under-water city.

The aeroplane was in good condition, and a thirty-minute flight brought the two men out over the North Sea.

While Silas and the doctor were waiting for their turn to pass through the door, the doctor showed the reporter an iron grating through which the ocean water was descending into an unused mine-shaft.

"We are now somewhere near Submarina, as I call the city," said the doctor, "so I will wireless the radio station to notify them of our arrival." Sitting down to his machine, he sent off a brief message and received the answer.

"All right," said he. "They say they will pilot us to our destination. See. The compass is turning to point the way."

Silas looked at the instrument indicated. It was different from any compass he had ever seen. It was a needle suspended on a universal joint, and it was surrounded by a number of electro-magnets, each designed to be rendered active only by a radio-wave of a special length. The operator in Submarina could thus turn the compass needle on the aeroplane in any direction he desired. The needle had now assumed a sloping direction, and the pilot of the aeroplane turned the machine in the same direction.

"We shall soon be in port, now," remarked Doctor Hackensaw.

"But what's the use of this guiding instrument?" asked Silas.

TO SUBMARINA

"This arrangement is absolutely necessary at present," replied the doctor, "because, as I told you, I am keeping the existence of this submarine city a complete secret. I myself could scarcely hope to find it, in this waste of water, without some guide."

Five minutes later the hydroplane had alighted on the surface of the ocean. Then it came to a complete stop, and a large yawning metal mouth came up out of the depths of the water and closed over it. Then it was dragged down into the ocean by means of a cable. Again there was a halt, followed by a click.

"We are now in one of the receiving compartments," expained Doctor Hackensaw. "This receiving chamber has closed over us, and we must wait until the water has been pumped out before we can emerge."

The pumping out did not take long. The metal mouth that enclosed them opened, and

(*Continued on page 910*)

At this moment a shriek from the woman with the baby called their attention to the fact that the mother burdened with the child had been unable to provide herself with life preservers or helmets. It was only with the greatest difficulty that Silas and the doctor managed to secure helmets for the two, and get the pair safely protected.

Google Original from UNIVERSITY OF CHICAGO

Zev-Papyrus Race, Camera War

How Rival Camera Men Tried to Get Exclusive Pictures of Zev-Papyrus Race.

BY W. B. ARVIN.

The outlawed cameramen—those who didn't pay any of the $50,000 to buy the privilege to take pictures—at the Zev-Papyrus race, showed their wits in defeating their rivals. One disguised himself as an expressman and set his camera up in a delivery van and got into the field, taking his pictures practically under the noses of the legitimate operators stationed on the stands at the finish line. Above is shown graphically how the two opposing sides fought to take their pictures. The company that paid for the privilege did everything to keep the others out and the others prepared for every emergency. The legitimate company fairly surrounded the track with a smoke screen seventy feet high. But they left one gap which happened to leave clear the line of vision of one cameraman perched in a tree. The man, however, upheld the ethics dictating that they wear caps. None appeared without them.

No General in the Great War took more precautions or laid his plans with more care than did the rival movie interests in their preparations for getting pictures of the great international turf event held at the Westchester Racing Association, in New York, when Zev and Papyrus met in the mile and one-half grueling test recently. It is said that one movie firm paid $50,000 for the exclusive rights to pictures of the meet; and that the same offer was made to no less than four other firms before the offer was taken. The movie men maintained that it just wasn't being done but the management maintained just as stoutly that it was. So the $50,000 was paid.

Then the firm that purchased the rights proceeded to make their rights exclusive. They hired a veritable army of spies to weed out the cameramen who might slip in at the gate. They rented all the houses around the course where their rivals might set up cameras with long distance lenses and even hired a couple of airplanes to patrol over the race course. Then they sent a pair of mirrors around the rear of the course and flashed light beams along the rail of the grandstand in order to blind any disguised picture-takers' cameras. They even protected the course with smoke pots, giving off great clouds of opaque smoke. But they were outwitted. The interlopers appeared in delivery vans, in crows-nests in trees adjacent to the course and even hired a few houses and two airplanes themselves. One company hired two movie actresses with cameras hid in vanity cases.

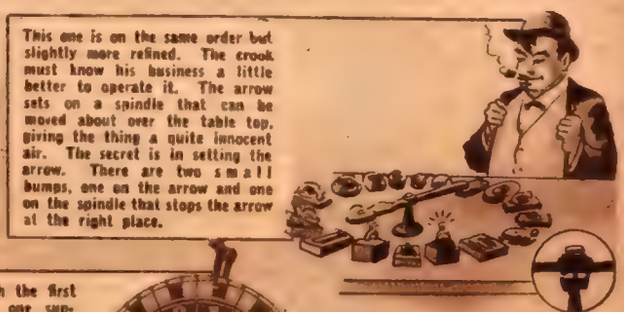
Digitized by Google
Original from UNIVERSITY OF CH

"Sure Things" At the County Fair

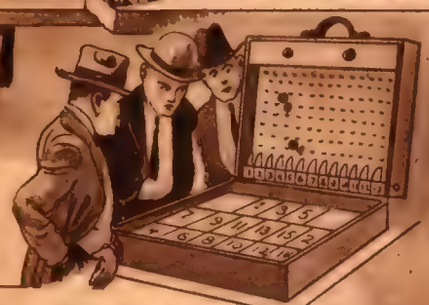
Methods of the "Con Men" for Parting the Yokel and His Money

BY W. C. KELLY.

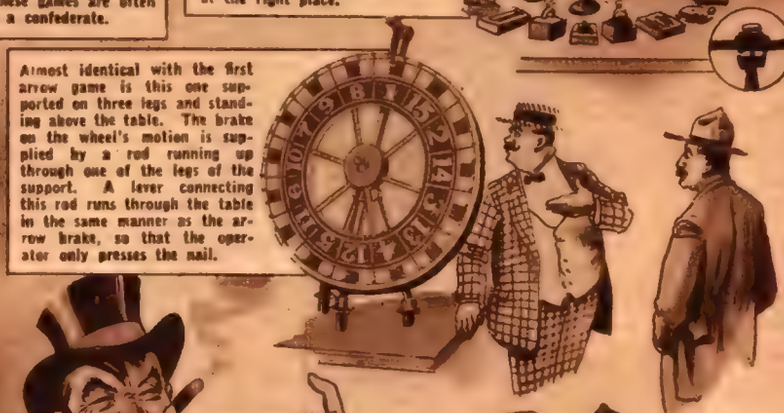
The little game played with the arrow spinning around over a list of numbers is known to every one who ever attended a street fair. It looks honest—and so do a lot of hold-up men. The trick is simple. By pressing an inconspicuous nail head at the end of the table the operator works a brake on the whirling arrow stopping it approximately where he wants it. These games are often worked with a confederate.



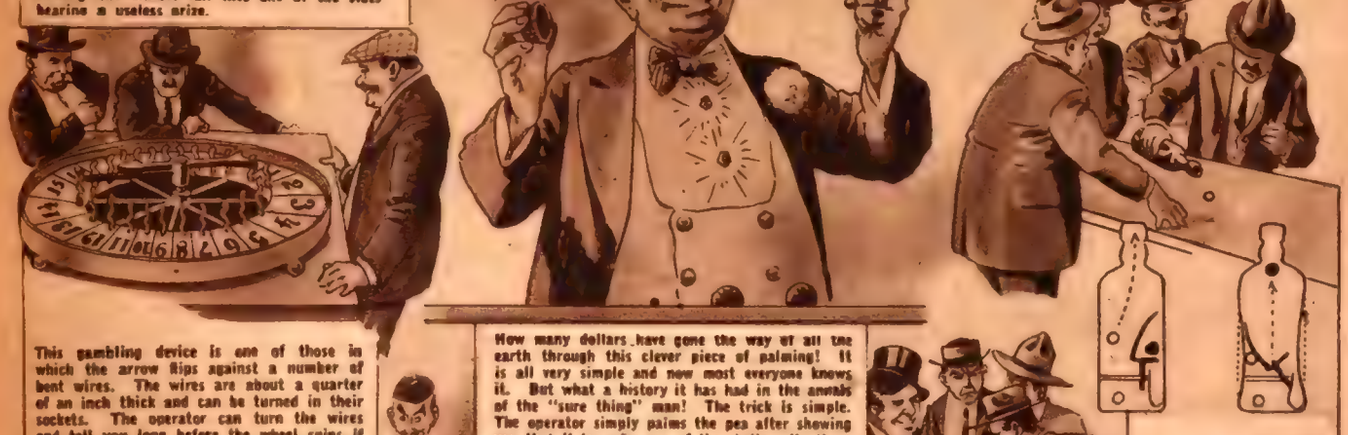
This one is on the same order but slightly more refined. The crook must know his business a little better to operate it. The arrow sets on a spindle that can be moved about over the table top, giving the thing a quite innocent air. The secret is in setting the arrow. There are two small bumps, one on the arrow and one on the spindle that stops the arrow at the right place.



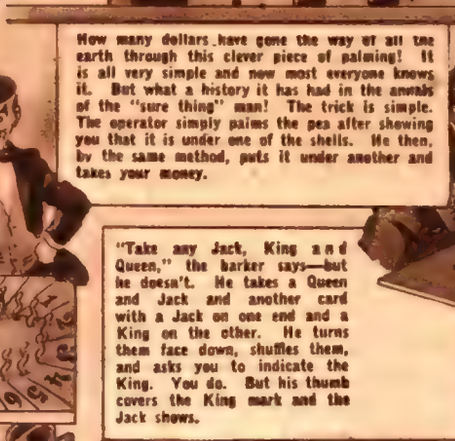
Here the fish puts the marble in one of the two holes at the top of the case and it falls down through a set of pins finally falling into one of the holes at the base of the contraption. The operator moves the baseboard slightly, making the marble fall into one of the slots bearing a useless prize.



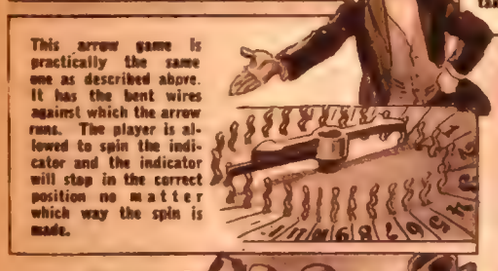
Almost identical with the first arrow game is this one supported on three legs and standing above the table. The brake on the wheel's motion is supplied by a rod running up through one of the legs of the support. A lever connecting this rod runs through the table in the same manner as the arrow brake, so that the operator only presses the nail.



This gambling device is one of those in which the arrow flips against a number of bent wires. The wires are about a quarter of an inch thick and can be turned in their sockets. The operator can turn the wires and tell you long before the wheel spins if it will stop on odd or even.

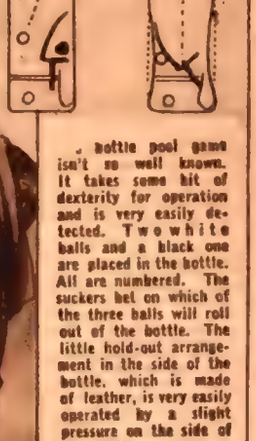


How many dollars have gone the way of all the earth through this clever piece of palming! It is all very simple and now most everyone knows it. But what a history it has had in the annals of the "sure thing" man! The trick is simple. The operator simply palms the pea after showing you that it is under one of the shells. He then, by the same method, puts it under another and takes your money.

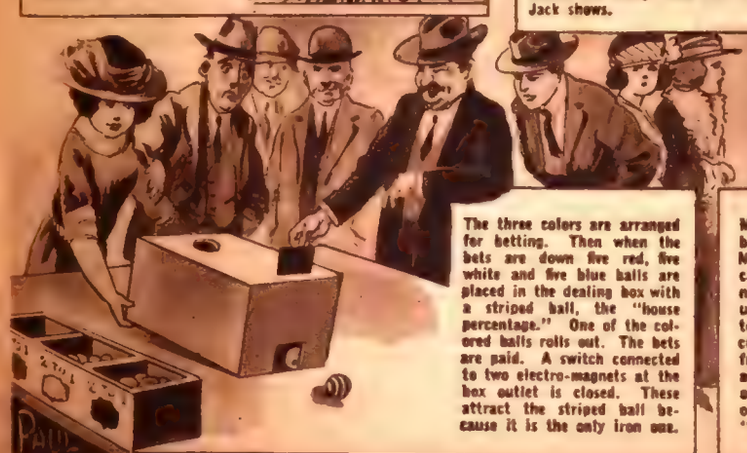


This arrow game is practically the same one as described above. It has the bent wires against which the arrow runs. The player is allowed to spin the indicator and the indicator will stop in the correct position no matter which way the spin is made.

"Take any Jack, King and Queen," the barker says—but he doesn't. He takes a Queen and Jack and another card with a Jack on one end and a King on the other. He turns them face down, shuffles them, and asks you to indicate the King. You do. But his thumb covers the King mark and the Jack shows.



The bottle pool game isn't so well known. It takes some bit of dexterity for operation and is very easily detected. Two white balls and a black one are placed in the bottle. All are numbered. The suckers bet on which of the three balls will roll out of the bottle. The little hold-out arrangement in the side of the bottle, which is made of leather, is very easily operated by a slight pressure on the side of the bottle.

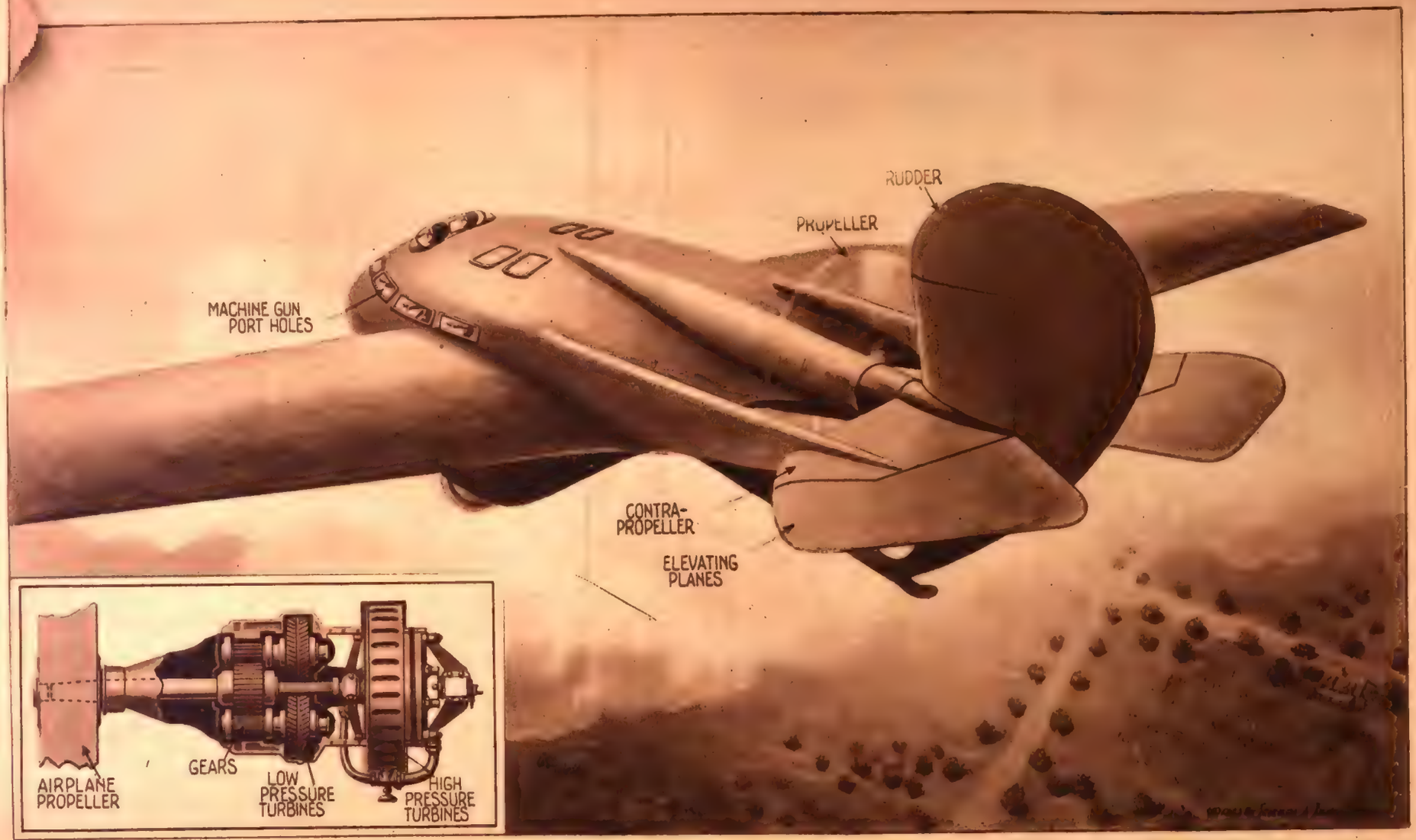


The three colors are arranged for betting. Then when the bets are down five red, five white and five blue balls are placed in the dealing box with a striped ball, the "house percentage." One of the colored balls rolls out. The bets are paid. A switch connected to two electro-magnets at the box outlet is closed. These attract the striped ball because it is the only iron one.

Many cigar stores and pool rooms have a board where dice are thrown for cigars. Notice that beneath the glass of the showcase there is what appears to be an innocent humidor. Usually six dice are used. The winnings are figured on the total number of points thrown. The secret is that the humidor contains a powerful magnet and that one side of the dice are loaded. Thus if the total shows signs of becoming too high the operator has only to connect the magnet, taking the "chance" out of the game.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Steam Driven Airplane



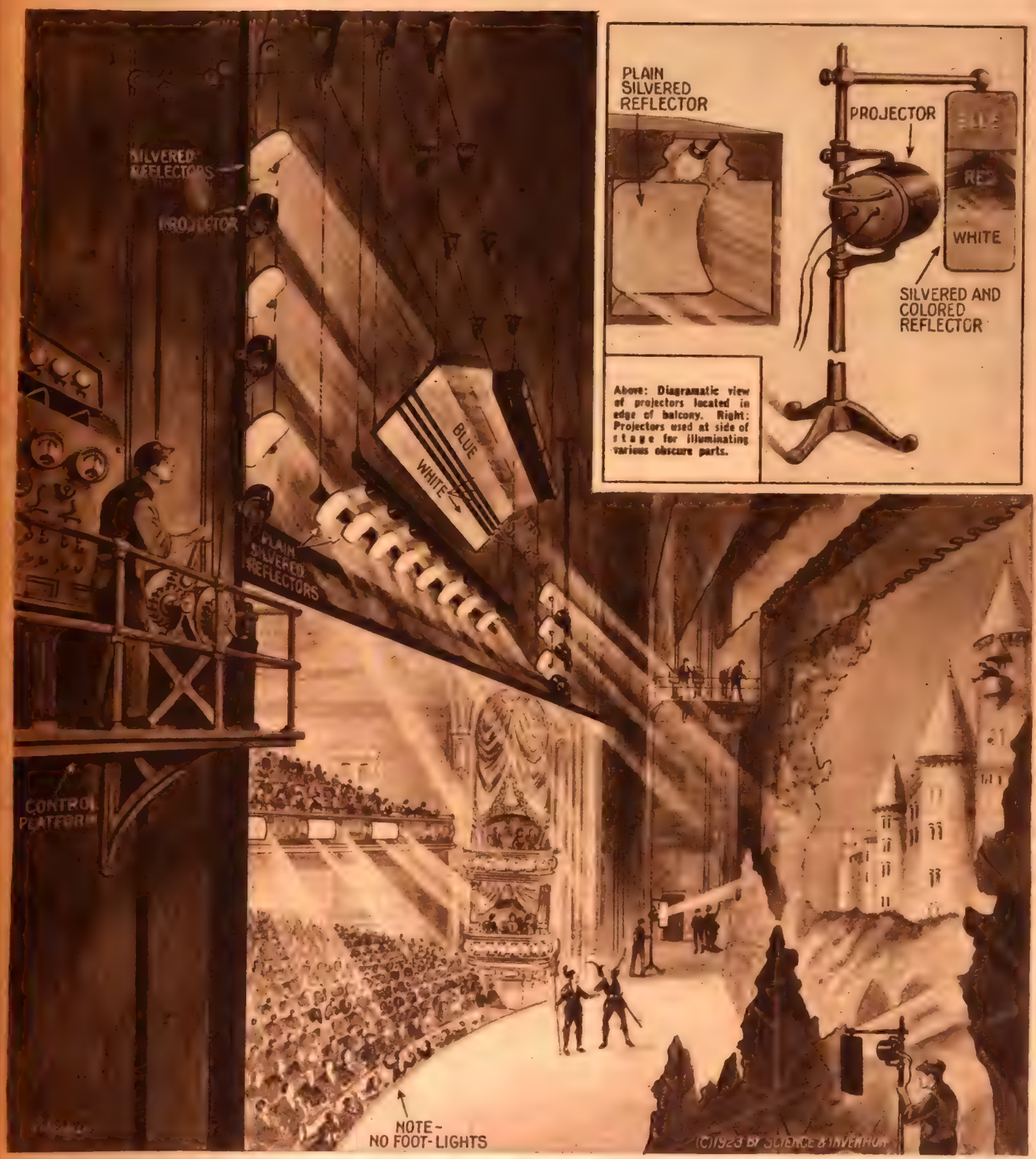
With the constant development of the airplane toward increasing its lifting power and speed, a German aeronautical designer has come forth with plans for the plane shown in the above drawing. As will be noted it is entirely streamline in body design, therefore reducing the air friction and resistance to the smallest possible amount. The real departure in the design of the machine, however, is in the driving force. The power plant, which is rated at producing 500 horse-power with the propeller revolving at 600 revolutions per minute is of the combined turbine design. That is, there are a series of turbines, all connected to the drive shaft and each one, after the first high pressure unit, taking the exhaust steam at a lower pressure. (steam at 1,000 lbs. pressure per sq. in. is used). The propeller is also equipped with a contrapropeller raising its efficiency about fifteen per cent. This contrapropeller forms a part of the rudder.

There is no doubt but that the new types of flying machines will do away with the gasoline engine, particularly when a high speed steam driven turbine can replace it, developing twice the horse-power for less than one-half the engine weight, and occupying approximately one quarter of the space which the usual engine of the gasoline type requires. The airplane illustrated above is of German origin. It is driven by a steam turbine in which use of the same steam is made in driving both the high pressure turbine and the low pressure turbines. In some designs four low pressure turbines are employed. The low pressure turbines and the high pressure turbines interact on one shaft, so that the combined energy is transmitted through a set of gears to the airplane propeller which turns at approximately 600 R.P.M. The efficiency of this airplane propeller is then materially increased to the extent of approximately fifteen per cent by equipping it with a contrapropeller. This contrapropeller forms a part of the rudder and elevating planes. Its purpose is to break up the air whirl thus increasing the efficiency of the center portion of the propeller, or that part nearest the hub, ordinarily quite useless. It will be seen that the airplane is designed along stream-lines, air resistance being reduced to a minimum. The 500 horse-power motor would drive one of these large planes.—Dr. Armin Demuth.

Digitized by Google
Original from UNIVERSITY OF CH

"Daylight" for the Stage

BY A. P. PECK



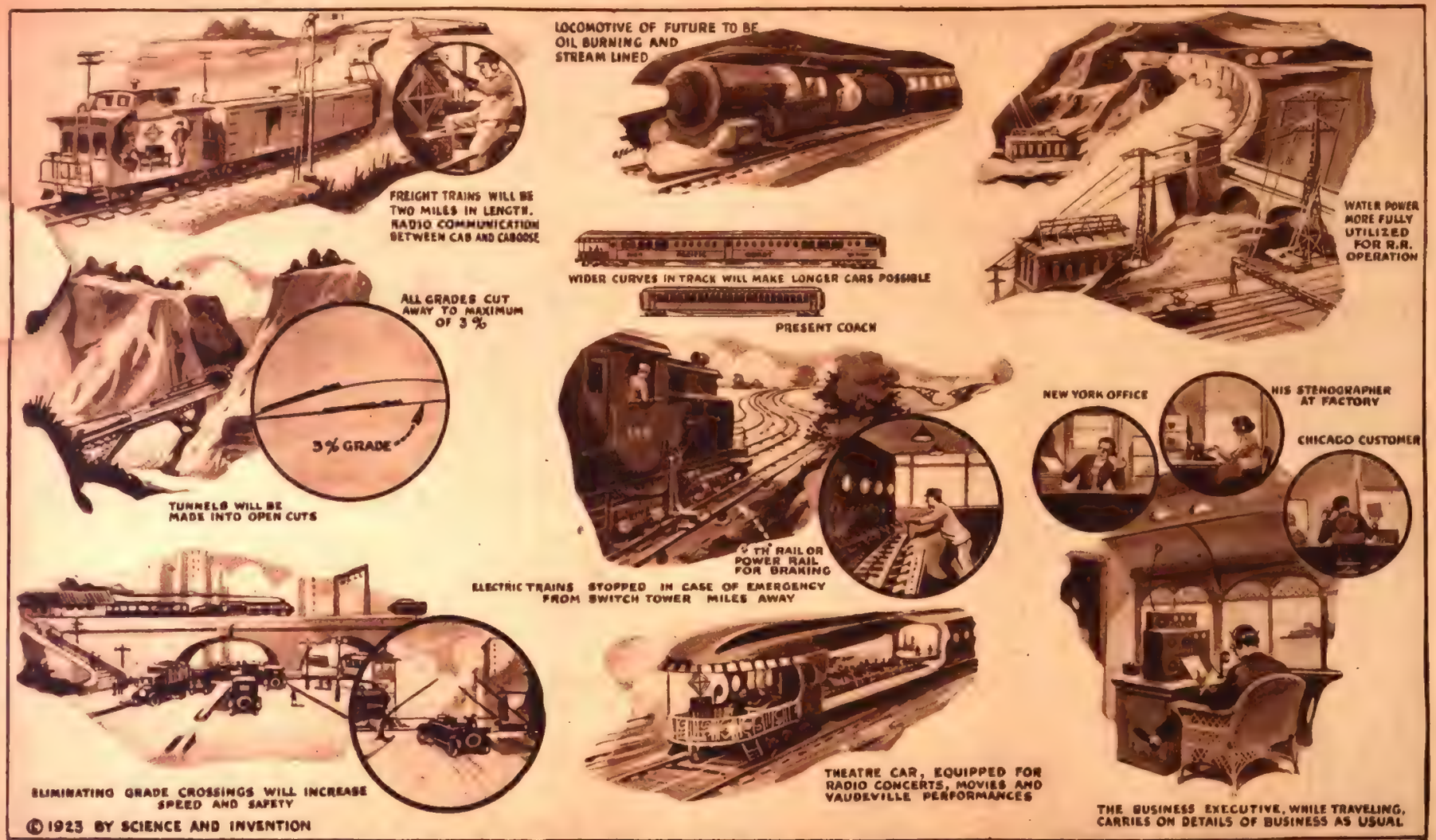
Above: Diagramatic view of projectors located in edge of balcony. Right: Projectors used at side of stage for illuminating various obscure parts.

Above will be seen a view, from back stage, of the latest and most up-to-date method of stage lighting. No direct light from the projectors is on the stage. All light which illuminates the characters and scenery is reflected from surfaces coated with a matte finished paper over which is placed silver leaf. This silver leaf idea is carried out through the entire arrangement, in some places being coated with transparent paint of different colors. The matte surface of the paper gives slight irregularities to the silver leaf and gives a wonderful diffusion of the light. The result approximates daylight. Twilight and fading out effects are obtained by gradually changing the positions of the reflectors so that the light from the projectors strikes a different color surface and, therefore, gives a different reflection. The angles and placements of the projectors and reflectors are controlled by means of ropes and any one or more of them can be changed instantly. The effect produced is very soft and the glaring footlights and "spots" are entirely eliminated. The actors are brought out in a clear manner and the sharp black shadows usually encountered in stage lightings are conspicuous by their absence. To the audience the effect of this lighting system is something bordering on the miraculous. The fading of day into dusk and then into almost complete darkness is carried out without any sharp line of demarcation between the various shades of light. This is, of course, done by tilting and moving to different positions, the colored reflectors. In conjunction with the moving of the reflectors the strength of the lights are also controlled by means of the standard stage rheostats so that various other blendings of colors and shades are possible. One of the greatest advantages of this system of stage lighting over the old type, utilizing gelatine screens, is that the same colors, or combinations of colors, can be reproduced innumerable times. In the case of the gelatine screens, it is almost impossible to obtain, say two red screens of exactly the same shade. The entire effect of a particular scene may be completely spoiled because of this. With the transparent paints, any shade may be reproduced any number of times.

Google

Engineer Predicts Rail Future

Famous Engineer Gives His Opinion on Railroad Advances of Future


FREIGHT TRAINS WILL BE TWO MILES IN LENGTH. RADIO COMMUNICATION BETWEEN CAB AND CABOOSE
LOCOMOTIVE OF FUTURE TO BE OIL BURNING AND STREAM LINED
WATER POWER MORE FULLY UTILIZED FOR R.R. OPERATION
WIDER CURVES IN TRACK WILL MAKE LONGER CARS POSSIBLE
PRESENT COACH
ALL GRADES CUT AWAY TO MAXIMUM OF 3%
3% GRADE
TUNNELS WILL BE MADE INTO OPEN CUTS
3rd RAIL OR POWER RAIL FOR BRAKING
ELECTRIC TRAINS STOPPED IN CASE OF EMERGENCY FROM SWITCH TOWER MILES AWAY
NEW YORK OFFICE
HIS STENOGRAPHER AT FACTORY
CHICAGO CUSTOMER
ELIMINATING GRADE CROSSINGS WILL INCREASE SPEED AND SAFETY
THEATRE CAR, EQUIPPED FOR RADIO CONCERTS, MOVIES AND VAUDEVILLE PERFORMANCES
THE BUSINESS EXECUTIVE, WHILE TRAVELING, CARRIES ON DETAILS OF BUSINESS AS USUAL
©1923 BY SCIENCE AND INVENTION

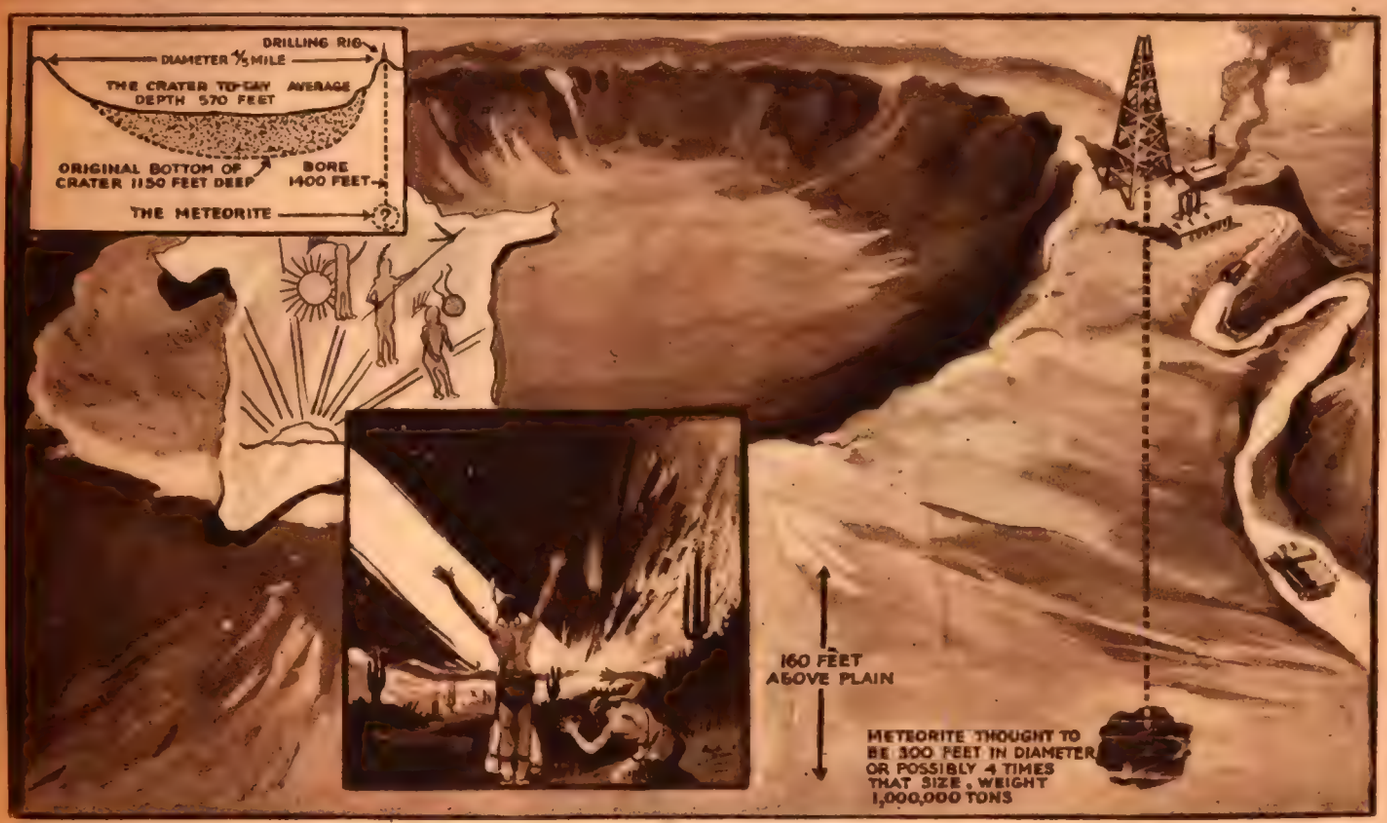
Above, illustrations are given to make clear to the reader what he may fully expect to see in the railroad equipment of 1948. These are the ideas of one of the foremost railroad engineering authorities in the country. Aside from the advancements that will be made in the luxuries that will accompany travel, there will be great strides taken in the direction of speed and safety. More attention is given to the safety of the railroad traveler than is given to those traveling by any other means. Though speed may be materially increased it will always be secondary to the safety of the passengers.

There is no end to the tales of great advancement made in the automotive and airplane speed records. But little is heard about the advancement made by the railroads. No less an authority than F. H. Hardin, Chief Engineer of Motive Power and Rolling Stock of the New York Central Railroad, comes forward with the announcement that the next twenty-five years will see the greatest advancement in the field of railroad engineering. If water power is developed to the extent where electrical power can be bought cheaply enough, we may look for the complete electrification of the railroads. With the widening of the curves longer cars will come into use and the trains pulled will be longer. Also, radio will come into use on long freight trains. At the present time some trains are more than a mile in length and with the constant perfection of the locomotive it is entirely possible that in the next twenty-five years we may look for freight trains two miles in length. They may be equipped with radio at both ends so that the two parts of the crew may be constantly in touch with each other. One of the chief fields for advancement, says Mr. Hardin, is in the field of signals and safety devices. Constant experiments are being made to remove the human element in operation as far as possible. This will be done by some form of electrical equipment that will enable the despatcher in the signal tower to stop the train without the assistance of the engineer in the cab. It is also possible that all long distance passenger trains of the future will be equipped with radio so that the passengers may keep in touch with their homes and offices all the time. Grade crossings will be removed and all grades in the line will be reduced to three per cent. At present, many of the fast trains have to run in sections necessitating an engine and crew for each section thereby increasing the operating costs. With the improvements in the road bed, longer and larger cars may be used doing away with this inefficiency. Cars equipped for movies, radio concerts and vaudeville will be the regular service on the faster trains

Digitized by Google

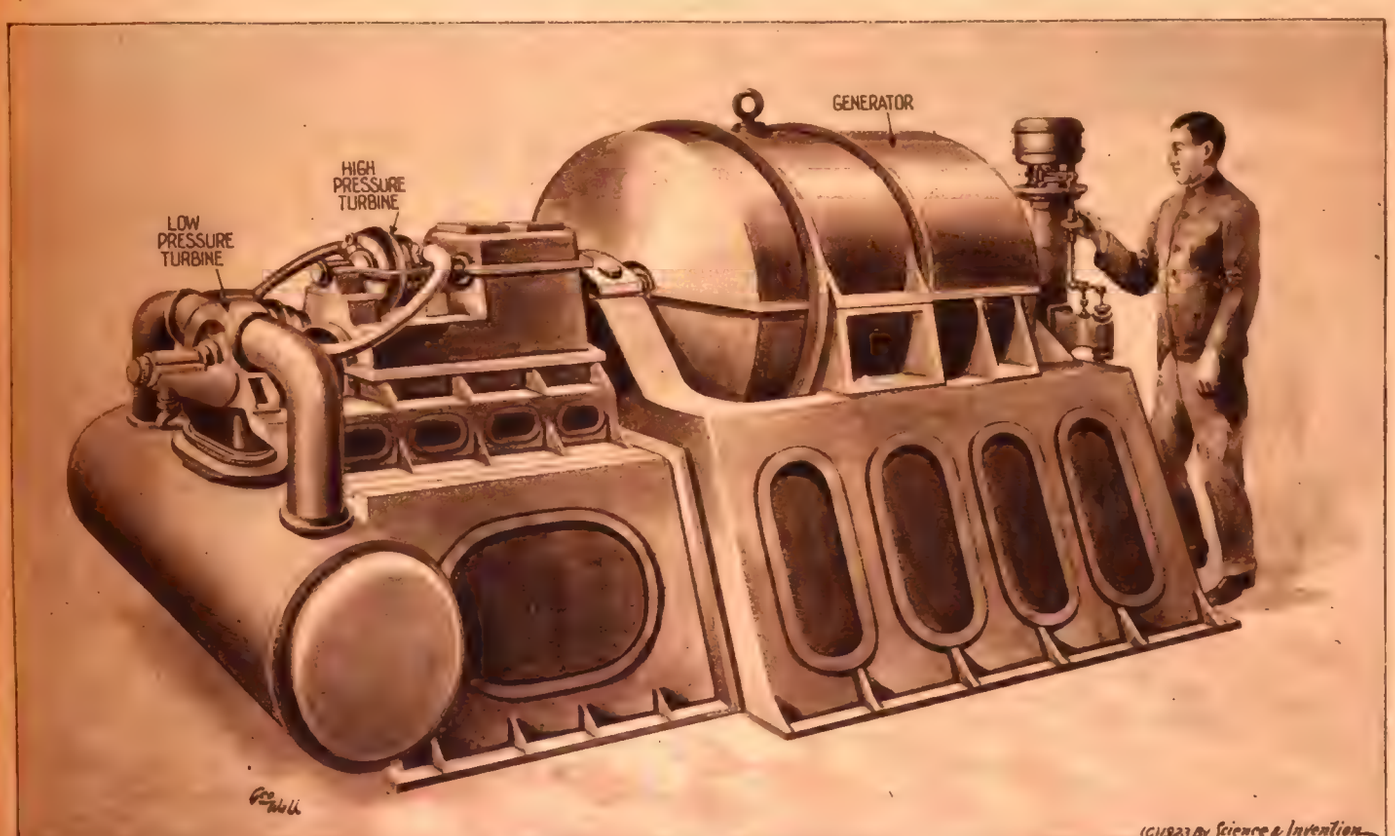
Original from UNIVERSITY OF CH

Million Ton Meteorite Found


DRILLING RIG
DIAMETER ½ MILE
THE CRATER TO-DAY AVERAGE DEPTH 570 FEET
ORIGINAL BOTTOM OF CRATER 1150 FEET DEEP
BORE 1400 FEET
THE METEORITE
?
160 FEET ABOVE PLAIN
METEORITE THOUGHT TO BE 300 FEET IN DIAMETER OR POSSIBLY 4 TIMES THAT SIZE, WEIGHT 1,000,000 TONS

A mining company has just started prospect drilling in Canyon Diablo, Arizona, in an attempt to discover the dimensions of a meteorite buried 1,400 feet underground which contains 90 per cent pure iron, 8 per cent nickel and quantities of platinum. The force with which it fell from the sky made the crater shown in the sketch. It is four-fifths of a mile in diameter and originally went to the depth of 1,150 feet. The Navajo Indians deify the meteorite. Its value is estimated at $15,000,000.

Small Turbine Drives Huge Generator



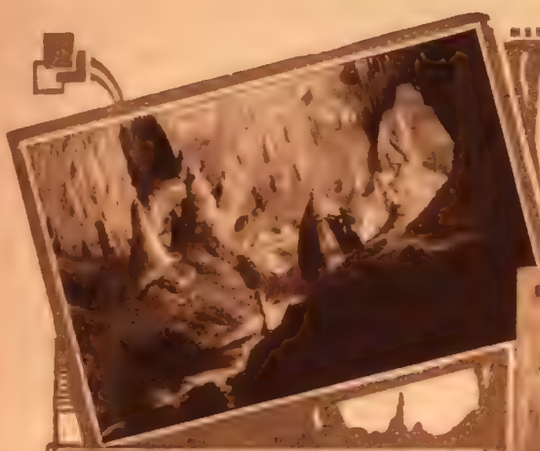
At first the small engine driving the electrical generator seems ridiculously inadequate. But the engine actually develops one thousand horse-power. The new high pressure (1,000 lb. per sq. in. steam pressure) turbine is coupled to the low pressure turbine, which latter makes use of the exhaust steam. Both are connected through gears.—Dr. A. Demuth.

Google Original from

Gigantic Arizona Cavern

Bones of First Discoverer Found in Little Known Cave

BY JOHN W. WELLS



WHAT is thought to be one of the largest caverns in the United States and one about which little has been heard is known as the Carlsbad Cave in Pecos County, Arizona. It is so large that, lacking any official action the full extent of the cave has never yet been ascertained. Explorations made have shown that it extends on one level for a distance of more than eight miles. Above is shown the entrance room to the cave.

An elevator is the only means of entrance into the cave. It was originally installed by a fertilizer company who mined in the cave. To the present time there has been no outlet to the cavern discovered save the small shaft descending into the ground to the entrance room. Above is shown one of the giant stalactites in the room known as the "King's Palace." These formations are noteworthy for their size. The roof of this room is over 200 feet high.

The two marvelous pillars shown in the above photograph are known as the "Twin Domes" and are situated at the entrance to the "Large Room" of the cavern. This room is itself one of the wonders of the trip through the cave since it is more than three-eighths of a mile long and about one-quarter of a mile wide. The two pillars are of the most perfect formation to be found in the cave. They are almost truly cylindrical in shape and are more than forty feet in diameter. The dark area just to the left of the column near the center of the photograph is the mouth of a fissure running down into the earth for a dis-.ance of two hundred feet and leading to another similar room.

Some idea as to the age of this cavern may be gained from the size of these stalagmites hanging from the roof of the cavern. It must be remembered that all these formations are caused by the slow dripping of water containing limestone in compound which is released when the water strikes the open air of the cavern. At the present time this water is dripping from the roof of the cave but the drops are so few that they are not noticed.

Above is shown a close-up of one of the walls of the large room. One of the peculiarities of this room is the fact that the walls of the cave are covered with the same sort of substance of which the stalagmites and stalactites are composed. Many of the formations on the wall defy the laws of gravitation since they protrude out from the wall at all sorts of angles like little bushes from the side of the mountain. No satisfactory scientific explanation for this sort of formation has as yet been given. The limestone-like substance covers the whole of the walls from the base all the way to the ceiling. This is the most wonderful room in the cavern.

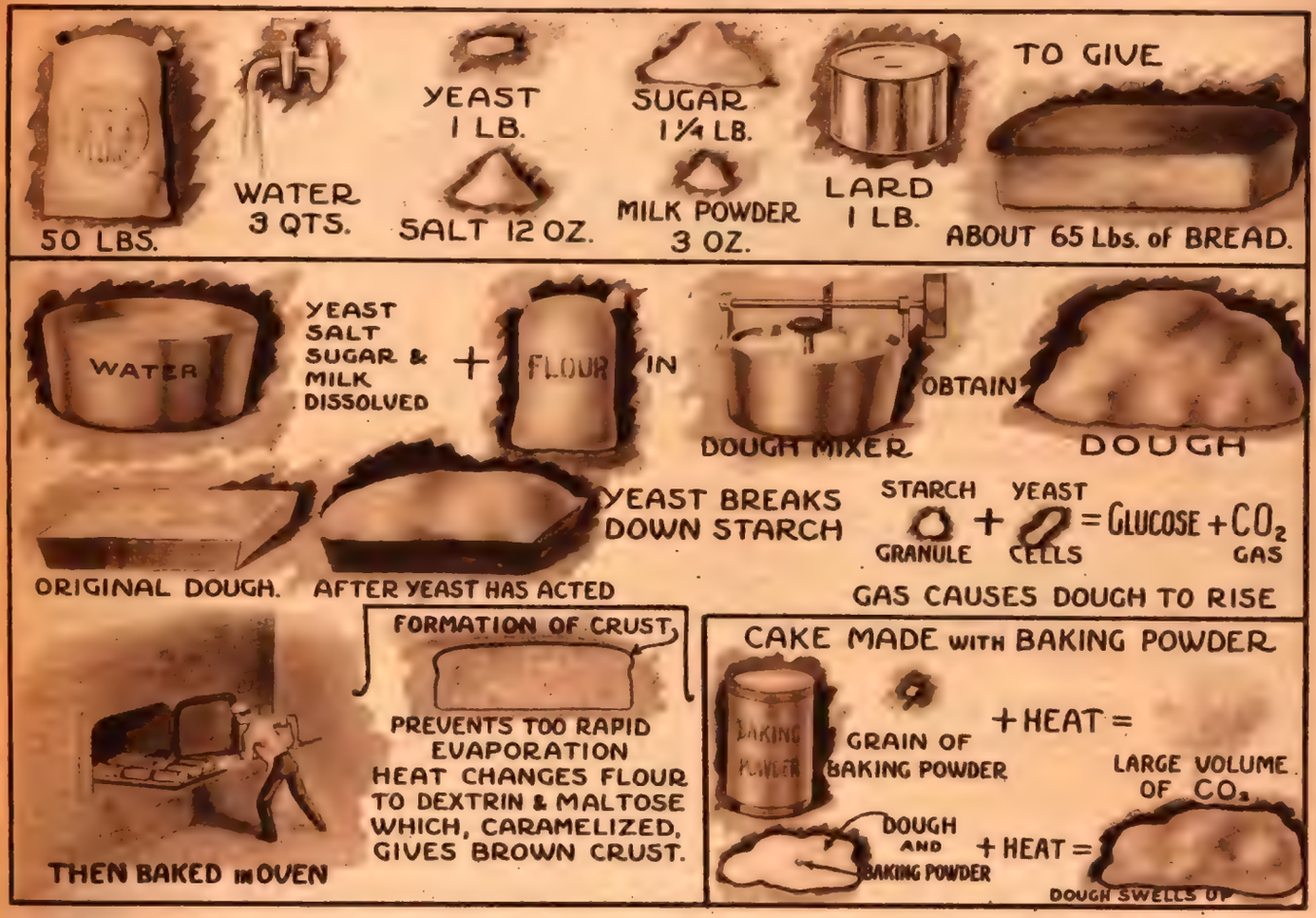
The dark spot flanking the pillar in the center of the above photograph marks the entrance into what is known as the "Devil's Pass." It was in this particular segment of the cavern that the first known exploration party found the skeleton of a man who is supposed to have attempted to make a trip through the cave and lost his way. The only method of passing through the "Devil's Pass" is over a small ledge that runs along the edge of a great chasm extending more than two hundred feet into the ground. It is the most dangerous passage of the cave.

Here is shown what is known as the "Temple of the Gods" with its marvelously colored grotesque formations known to the explorers as the "Totem Poles." (All the rooms and locations have been named by the guide who is also caretaker of the cave and the meagre machinery of the fertilizer company.) The only inhabitants of the cave are bats. But there are millions of them seemingly, from the tales of those who are hardy enough to make the little known day's trip through the cavern. It is said that the Department of the Interior is laying plans for an exploration of the cave.

Digitized by Google
Original from UNIVERSITY OF CHI

The Chemistry of Bread Making

BY ISMAR GINSBERG, B. SC., CHEM. ENG.



That a gas is actually made in the loaf of rising bread is generally known, but the facts as to how this gas is produced is one of those everyday chemical mysteries. It is a result of the mixture of yeast, starch and heat. The flour of the bread, in connection with the water and milk powder (the flour and milk containing starch) when the heat is added react with the yeast. The yeast cells have the power, when brought into contact with starch, to cause a change in its form. This happens in the bread. The starch is changed to glucose and carbon dioxide. This gas causes the "pockets" in the bread, causing the rise. The crust is caused by the heat.

Models That Vie with Reality

One of the biggest attractions at the Electrical Show in New York was the complete model of the world's largest power house. It is a remarkable replica of the giant power house at Hell Gate that produces more than 300,000 kilowatts. To the right is shown a small toy loom made along the exact lines of the regular business sized machine used in all the cloth weaving mills. It conforms in all details of design to the original from which it is reproduced.

Google Original from UNIVERSITY OF CHICAGO

Chart of the Development of Man

Graphic Depiction of the Rise of Man from the Anthropoid Ape

BY DR. O. HAUSER

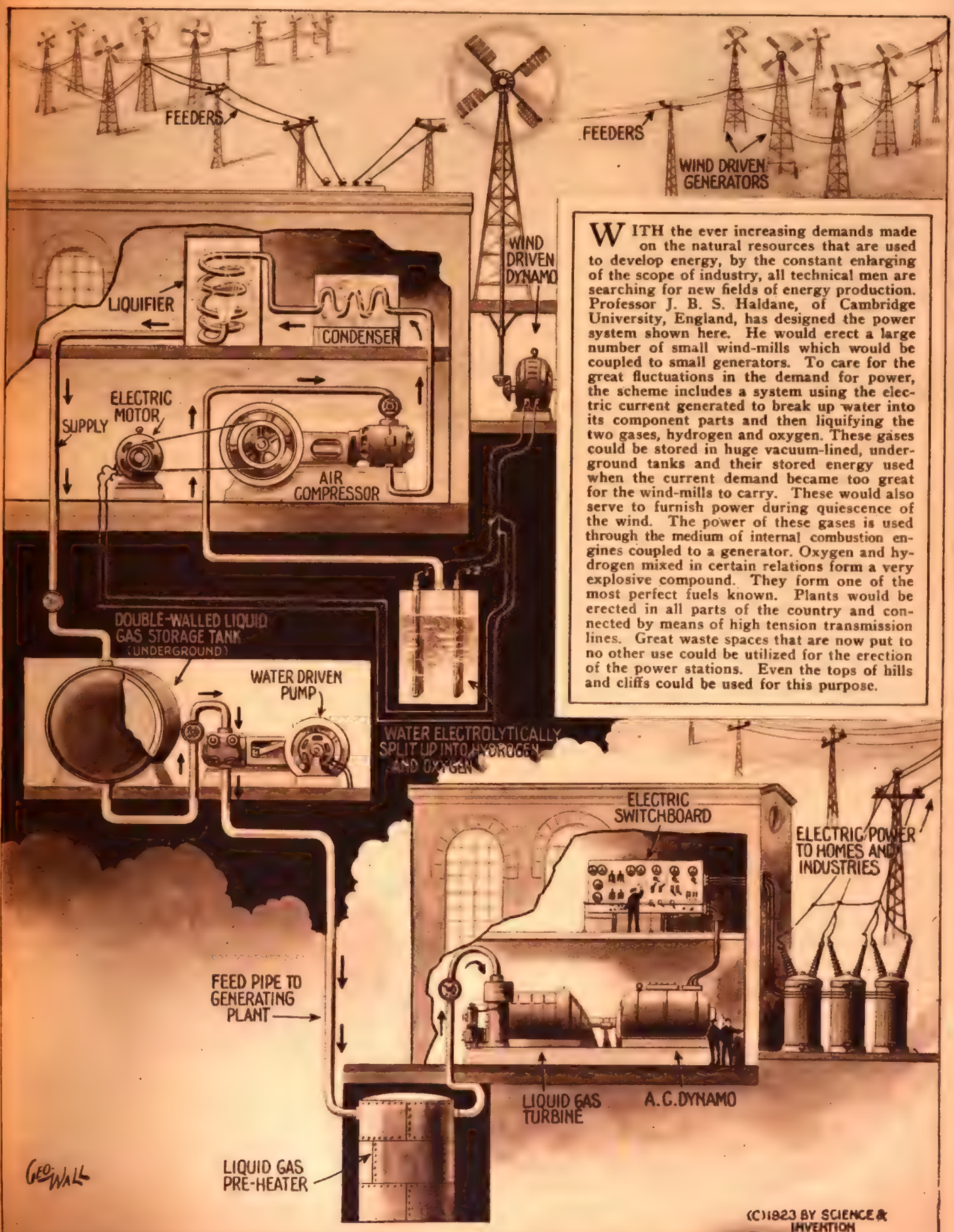
MODERN ERA
ROMAN ERA
IRON AGE
BRONZE AGE
NEOLITHIC
ALLUVIUM
Beginning with the close of the Tertiary period (which to the present time has contributed no fossilized remains or evidence of man) this chart, translated by Dr. Alfred Grademwitz, shows the various stages of the development of the Pithecanthropus (which was not of the species Homo nor yet Anthropoid Ape) down through the beginnings of the Quartenary period and down to the present time.
PALAEOLITHIC
FOURTH GLACIAL PERIOD
MAGDALENIEN
SOLUTREEN
AURIGNACIEN
THIRD INTER-GLACIAL PERIOD
MICOQUE
EHRINGSDORF
THIRD GLACIAL PERIOD
MOUSTERIEN
ACHEULEEN
INTERGLACIAL PERIOD
CHELLE'EN
DILUVIUM OR QUARTERNARY PERIOD
TERTIARY PERIOD
© 1923 BY SCIENCE AND INVENTION

Digitized by Google
Original from UNIVERSITY OF

Huge Wind Power System

Cambridge University Professor Submits Plan to Harness Wind.

BY RAYMOND FRANCIS YATES



WITH the ever increasing demands made on the natural resources that are used to develop energy, by the constant enlarging of the scope of industry, all technical men are searching for new fields of energy production. Professor J. B. S. Haldane, of Cambridge University, England, has designed the power system shown here. He would erect a large number of small wind-mills which would be coupled to small generators. To care for the great fluctuations in the demand for power, the scheme includes a system using the electric current generated to break up water into its component parts and then liquifying the two gases, hydrogen and oxygen. These gases could be stored in huge vacuum-lined, underground tanks and their stored energy used when the current demand became too great for the wind-mills to carry. These would also serve to furnish power during quiescence of the wind. The power of these gases is used through the medium of internal combustion engines coupled to a generator. Oxygen and hydrogen mixed in certain relations form a very explosive compound. They form one of the most perfect fuels known. Plants would be erected in all parts of the country and connected by means of high tension transmission lines. Great waste spaces that are now put to no other use could be utilized for the erection of the power stations. Even the tops of hills and cliffs could be used for this purpose.

Google Original from UNIVERSITY OF CALIFORNIA

A Million Volts Under Control!

Experiments In Home-made Lightning Flashes

It is hard to visualize the actual size of the spark shown in the above picture, made in one of the experiments at the high potential laboratory of the Westinghouse Electric and Manufacturing Co. The spark here liberated is more than twenty feet in length and represents 350,000 volts. This spark, representing literally thousands of horse-power, was used in testing the dielectric value of an insulator. The insulator was placed in the transmission line from the high potential transformer and the voltage gradually raised until the current became more than the insulator could stand, which was indicated by the spark jumping across the terminals to the conductor at the other end of the insulator.

Interior of the high-voltage laboratory of the Westinghouse Electric and Manufacturing Co., at Trafford City, Pa. The huge million-volt transformer can be seen in the right of the photo. This is the only transformer of the kind in the world. A good idea of the size of the apparatus used in the experiments with the so-called artificial lightning can be gained by comparing the size of the man standing by the huge spark gap shown in the extreme right of the picture. A traveling crane has to be used in the building for moving the various pieces of apparatus from one part of the laboratory to another. An even larger gap can be seen just beyond the smaller one. One point of the gap is supported from the ceiling by the huge steel frame-work of the building while the other is mounted on a great insulating pillar. The noise of the sparks released by the high potential currents is deafening.

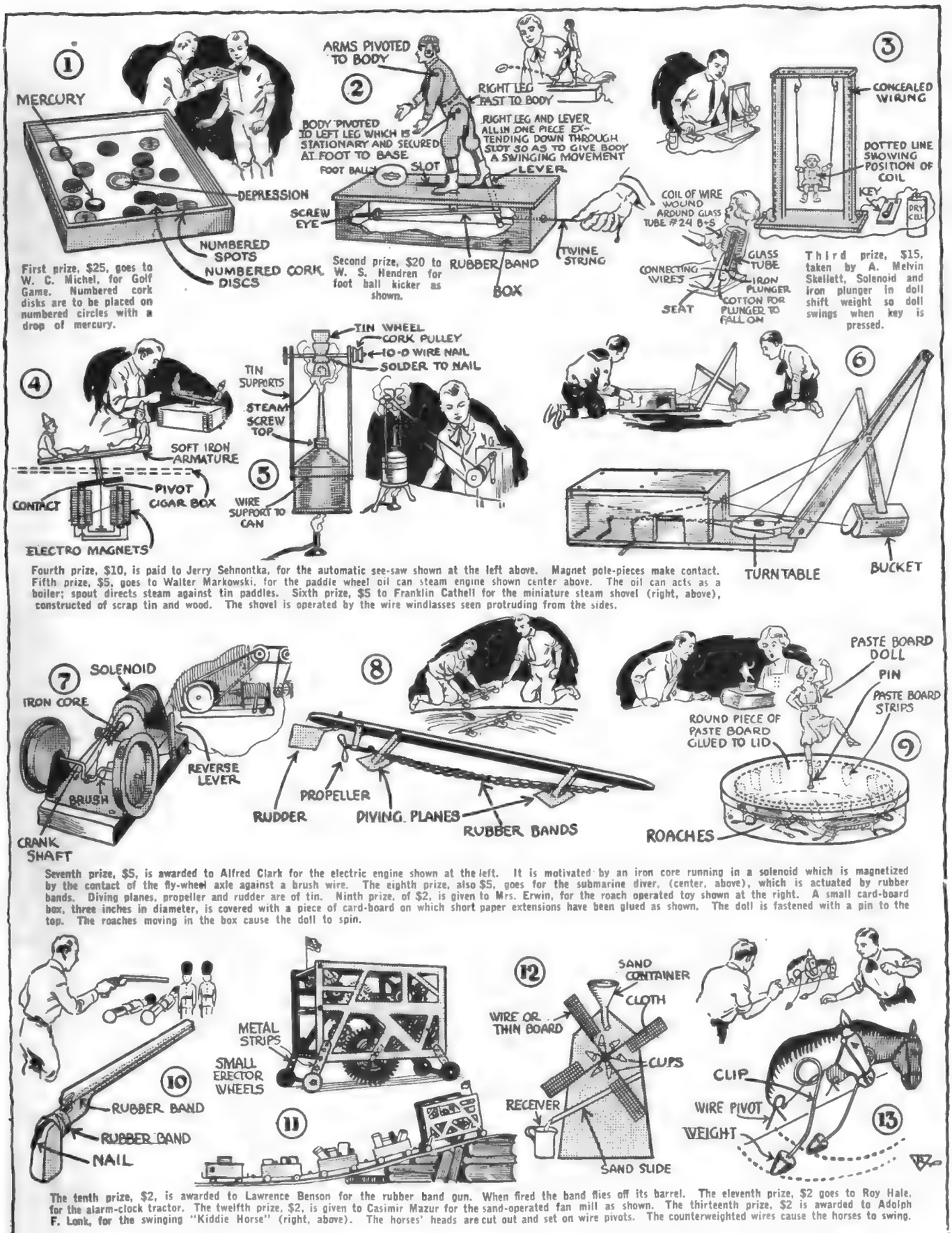
A forty-two foot controlled arc! It hardly seems necessary to add that this is the longest controlled arc ever made. One million volts transmitted to the ends of the conductors between which the arc occurred was necessary to produce this arc. It was drawn in tests for "Wet Flashover," which is a test applied to the conditions under which high tension lines must operate in rainy weather. Accurate comparison of the hugeness of this discharge may be gained by comparing the thickness of the flash as well as its length with the size of two men shown standing in the photograph. The arc was held under perfect control.

This photograph is another flashover test made in the laboratory. It reveals 800,000 volts game on the rampage. In taking this photograph a series of quartz lenses were used, thus bringing into prominence the ultra-violet rays which would not be recorded using the common method of making the photograph. By this method the flare-out at the top of the spark column is shown that would otherwise be invisible. The spark here, as in the first picture, is breaking over the capacity of an insulator. With the use of the ultra-high voltages used in the laboratory the engineers of the company are able to ascertain with almost exact certainty just how any piece of high tension apparatus is going to work when it is put into actual operation and just what its limit of strength is. Experiments are constantly being carried on looking toward ultra-long distance transmission of power service.

Google Original from UNIVERSITY OF

$100 Toy Contest Prize Winners

Results of Contest Announced in October Issue.



First prize, $25, goes to W. C. Michel, for Golf Game. Numbered cork disks are to be placed on numbered circles with a drop of mercury.

Second prize, $20 to W. S. Hendren for foot ball kicker as shown.

Third prize, $15, taken by A. Melvin Skellett, Solenoid and iron plunger in doll shift weight so doll swings when key is pressed.

Fourth prize, $10, is paid to Jerry Sehnontka, for the automatic see-saw shown at the left above. Magnet pole-pieces make contact. Fifth prize, $5, goes to Walter Markowski, for the paddle wheel oil can steam engine shown center above. The oil can acts as a boiler; spout directs steam against tin paddles. Sixth prize, $5 to Franklin Cathell for the miniature steam shovel (right, above), constructed of scrap tin and wood. The shovel is operated by the wire windlasses seen protruding from the sides.

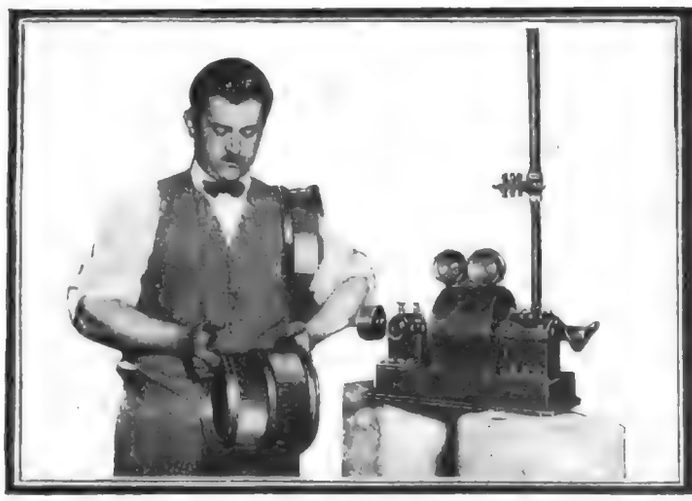
Seventh prize, $5, is awarded to Alfred Clark for the electric engine shown at the left. It is motivated by an iron core running in a solenoid which is magnetized by the contact of the fly-wheel axle against a brush wire. The eighth prize, also $5, goes for the submarine diver, (center, above), which is actuated by rubber bands. Diving planes, propeller and rudder are of tin. Ninth prize, of $2, is given to Mrs. Erwin, for the roach operated toy shown at the right. A small card-board box, three inches in diameter, is covered with a piece of card-board on which short paper extensions have been glued as shown. The doll is fastened with a pin to the top. The roaches moving in the box cause the doll to spin.

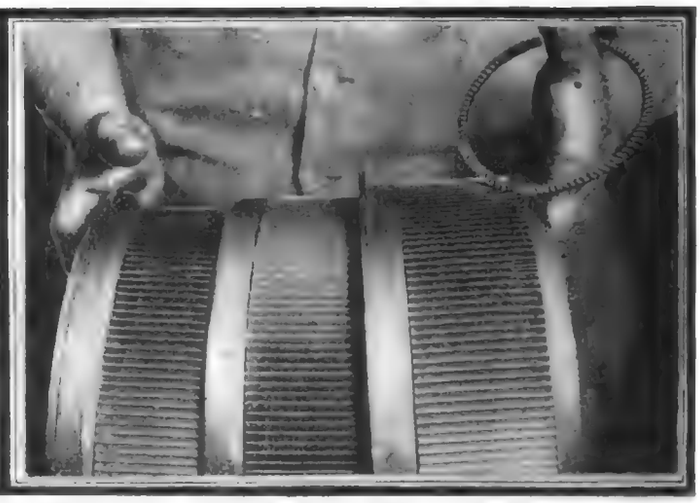
The tenth prize, $2, is awarded to Lawrence Benson for the rubber band gun. When fired the band flies off its barrel. The eleventh prize, $2 goes to Roy Hale, for the alarm-clock tractor. The twelfth prize, $2, is given to Casimir Mazur for the sand-operated fan mill as shown. The thirteenth prize, $2 is awarded to Adolph F. Lonk, for the swinging "Kiddie Horse" (right, above). The horses' heads are cut out and set on wire pivots. The counterweighted wires cause the horses to swing.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

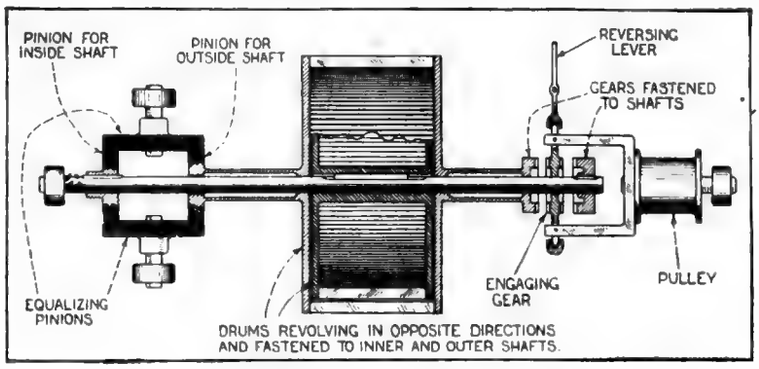
New Design of Reversible Turbine

Rotors Running in Opposite Directions Are Geared to Shaft.



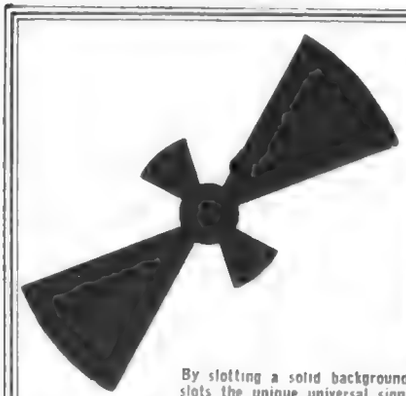


BOVE at the left will be seen a completed model of the reversible steam turbine invented by Mr. Bonom. The gentleman in the photograph is holding two of the rotors and one of the separating rings. It will be noticed that the two rotors have their blades set at different angles so that with steam passing through them in the same direction, the two rotors are revolving in opposite directions. This is what takes place continuously in the turbine, the compensating gears transmitting the power to the shaft so that it revolves in the same direction, even though the rotors are revolving in different ways.

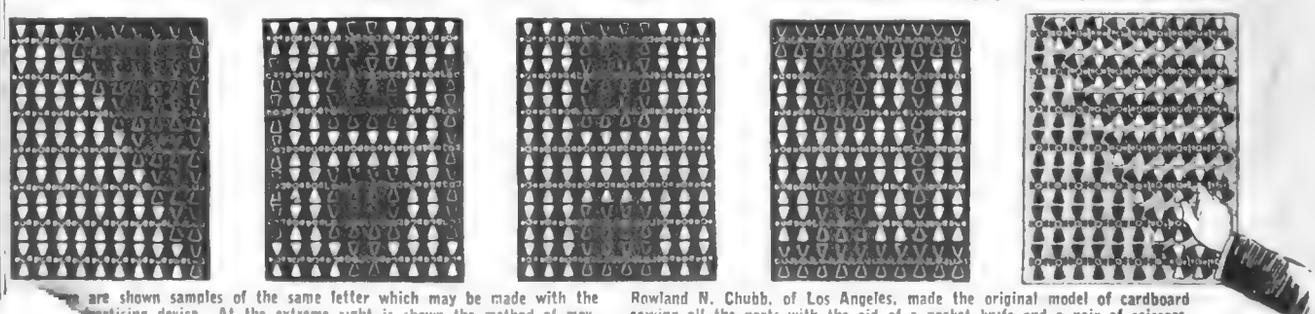


THE above photograph is a close-up view of the two rotors used in the reversible steam turbine. Note the angles of the blades. At the left is a simplified view of the different parts of this reversible turbine. Note how the two rotors revolve in opposite directions and how they are geared to the main shaft by means of beveled gears and a hollow and a solid shaft. By means of one sliding gear connected to a handle at the extreme right, the direction of the rotation of the pulley may be changed at will without stopping the turbine or changing the direction of the rotation of the blades. This is similar to an ordinary reversing device, the novelty lying in the rotors traveling in opposite directions.

Unique Universal Letter Sign



By slotting a solid background and fitting it with shutters to cover the slots the unique universal sign, shown above, is made. The shutters and the background being of the same color, when the shutters are closed the sign face presents a solid appearance. The letters are made by turning the shutters one-eighth turn on their pivots which permits light to shine through the slots making the letters. Any design may be executed on the board. The shutters are light and require only a touch of the finger to move them, making the changing of the sign a very small bit of work.



...e are shown samples of the same letter which may be made with the ...vertising device. At the extreme right is shown the method of mov... shutters. The whole thing is made of a light grade of sheet steel once in place is little trouble to the advertiser. The inventor, Rowland N. Chubb, of Los Angeles, made the original model of cardboard carving all the parts with the aid of a pocket knife and a pair of scissors. The shutters are fitted with a small wing on one side which is used to open them.

—Edwin Haynes.

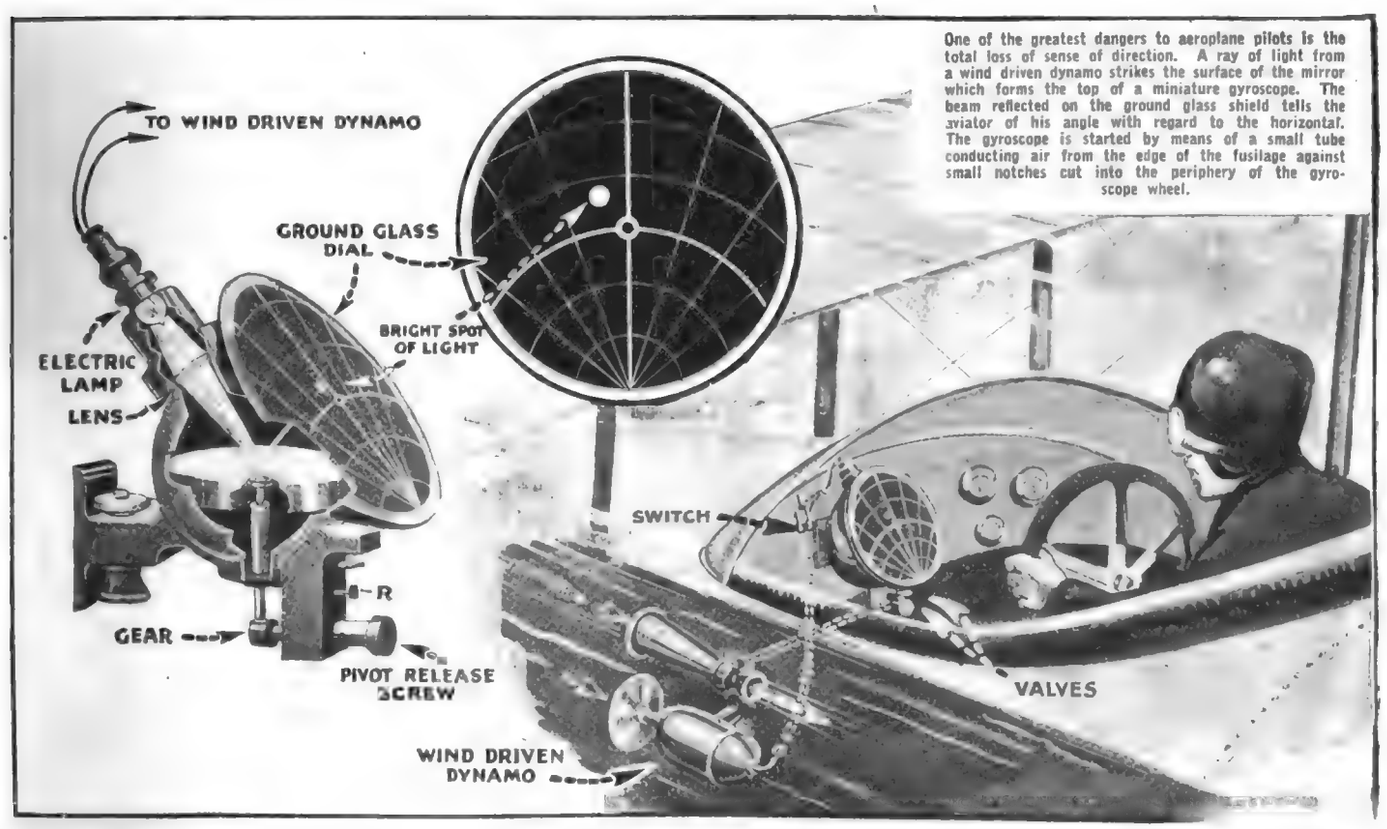
Digitized by Google
Original from UNIVERSITY OF CHICAGO

Parlor, Bedroom and Kitchenette

A new complex apartment recently opened in Newark, N. J. The apartments consist of one large room, a small foyer, dressing alcove and bath. The large room becomes living room, bedroom, kitchen and dining room with a few twists of the wrist. The beds fold from doors, at night.
The kitchen in the apartment. Curtains are drawn in front of it when it isn't in use. It has stove, ice-box and sink with hot and cold water.
FLOOR PLAN
Both the rooms shown here are the same. To the left is the living room when the tenants are ready to retire. In the morning it becomes again the charming living room seen at the right. The library table, by simply pulling a lever concealed beneath it, becomes a dining table. The telephone connects through a baseboard plug.

Horizontal Indicator for Planes

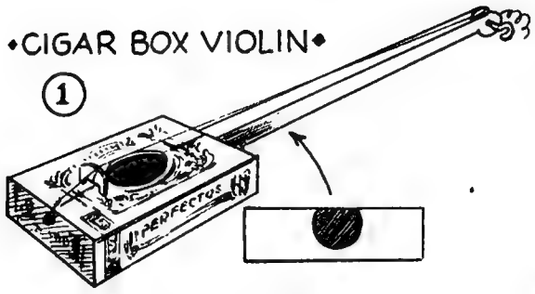
By STANLEY Y. BEACH

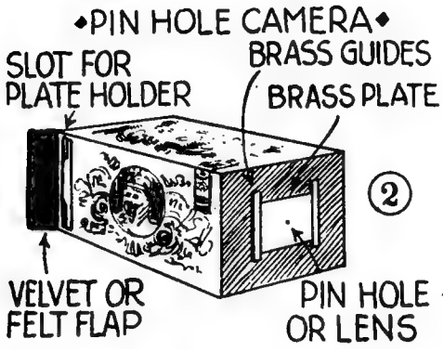

One of the greatest dangers to aeroplane pilots is the total loss of sense of direction. A ray of light from a wind driven dynamo strikes the surface of the mirror which forms the top of a miniature gyroscope. The beam reflected on the ground glass shield tells the aviator of his angle with regard to the horizontal. The gyroscope is started by means of a small tube conducting air from the edge of the fusilage against small notches cut into the periphery of the gyroscope wheel.
TO WIND DRIVEN DYNAMO
GROUND GLASS DIAL
BRIGHT SPOT OF LIGHT
ELECTRIC LAMP
LENS
SWITCH
R
GEAR
PIVOT RELEASE SCREW
VALVES
WIND DRIVEN DYNAMO

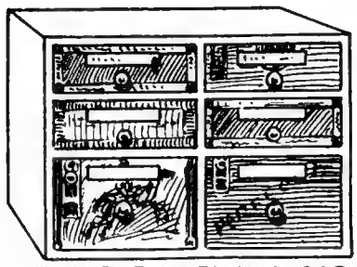
Digitized by Google
Original from UNIVERSITY OF CHICAGO

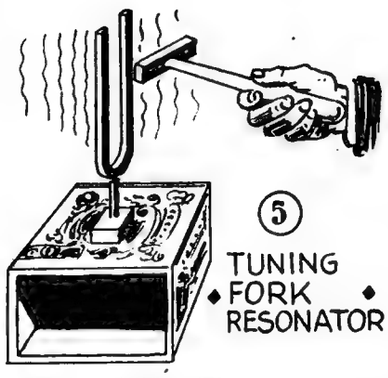
"Cigar Box" Contest--$100.00 in Prizes

Think of All the Devices You Ever Saw Made from Cigar Boxes.









CIGAR boxes are cheap. As a matter of fact in most towns they are thrown away by storekeepers. Why not make good use of these? The wood may be used for various purposes, and the cigar box, either cut or whole, finds numerous uses. On this page we are showing examples of various devices in which cigar box wood is used entirely in their construction. We want more ideas and will pay for these suggestions. Of course, none of the uses for cigar boxes or cigar box wood depicted upon this page, will be awarded prizes.

It will be seen that you may construct anything using cigar box wood exclusively in the building of the device. It can be a toy, a table, a piano or a watch charm. Fig. 8 on this page is a cigar box telephone. A hole has been cut in one side of the cigar box, and the string passes from the other side to a duplicate box at a neighbor's house. The string must be tightly held. Fig. 9 is a simple stereoscope constructed as illustrated. Fig. 10 is a method of using a cigar box so as to permit the entire family to enjoy the radio concerts from a receiving set of relatively low power amplification.

The conditions of this contest are:

Contest closes in New York on March 10th at 12:00 o'clock midnight.

All material must be in our hands at this time.

Participants are not limited as to the number of entries.

Everybody, man, woman and child, is eligible.

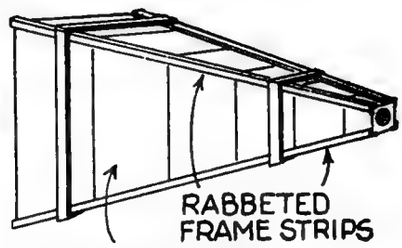
A sketch and a 100-word article are all that is necessary, although models should preferably be submitted.

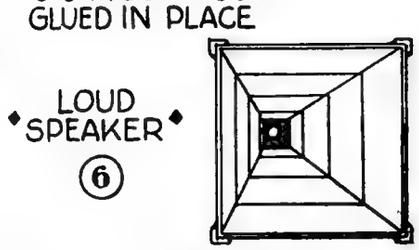
In event of a tie for any of the awards, participants so tying will be given prizes identical to those tied for.

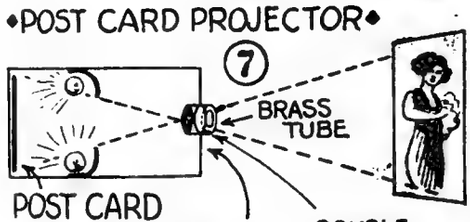
$100.00 will be awarded

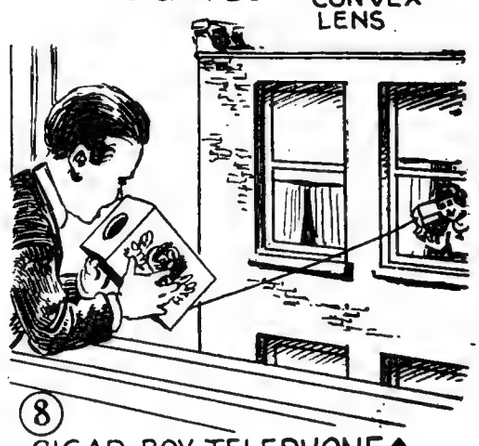
THERE ARE TWELVE PRIZES AS FOLLOWS:

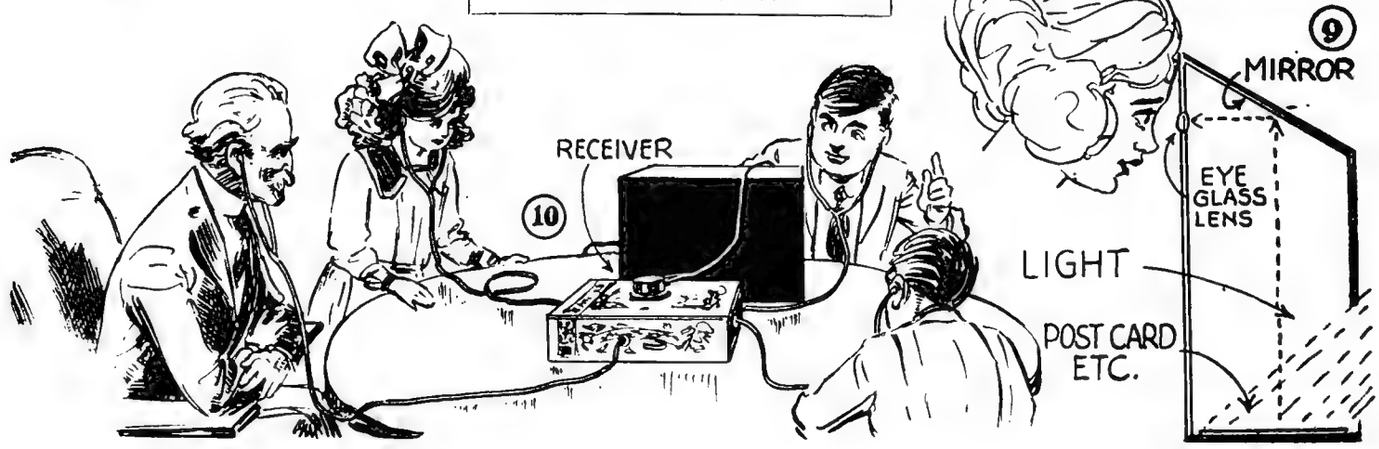
First prize	$25.00
Second prize	20.00
Third prize	15.00
Fourth prize	10.00
Four prizes, each of	5.00
Four prizes, each of	2.50











Digitized by Google
Original from UNIVERSITY OF CHICAGO

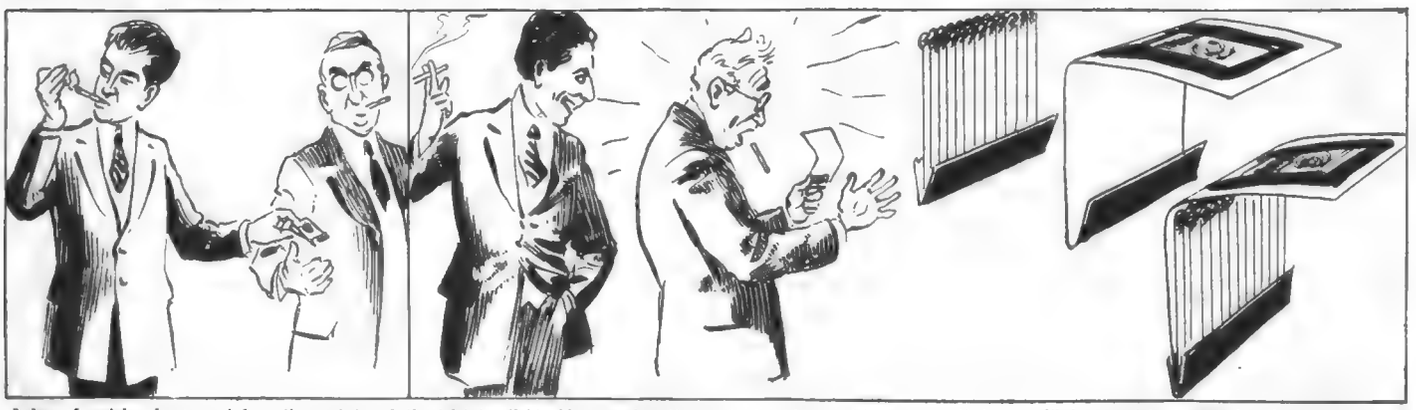
Magic for Everybody

BY PROF. JOSEPH DUNNINGER.

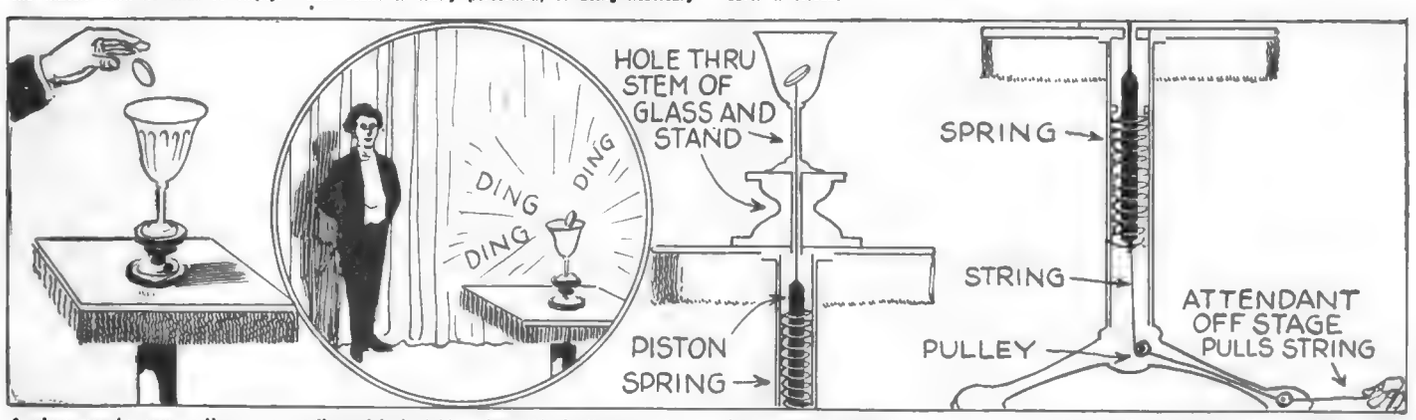
NO. 10 OF A SERIES.

DUPLICATE SHEET PASTED BENEATH
TEAR ALONG DOTTED LINES AND PLACE PIECES ON OPPOSITE SIDE OF FOLDED SHEET
1st. FOLD
THEN PLACE ON TABLE WITH FOLDED SIDE UP AND UNFOLD
TORN PIECES
2nd. FOLD

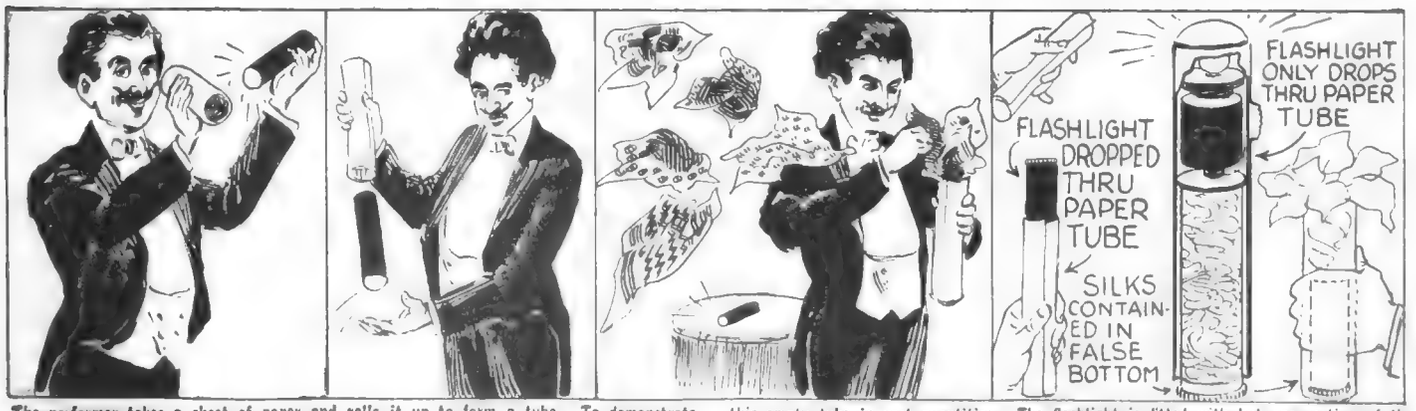
A sheet of paper is held up and then torn longitudinally in three pieces. These are placed in front of each other and then folded in thirds. Some one is requested to initial the paper, and when it is opened, the paper will be found whole again. Two papers of identical size are pasted together. One of them, however, has been folded up as shown in the illustration. When the paper is torn, the performer is careful not to show the folded piece. These torn parts are folded up. The whole sheet is opened.



A box of matches is removed from the pocket and the trickster lights his own cigarette. His friend is waiting for a light and asks for it. The book of matches is closed and handed to the waiting guest, so that he can light his own cigarette. When he opens the match book he finds it empty. This stunt is easily performed, it being necessary to tear two match books so that one will be complete, except for the cover, and the other will contain no matches. The group of matches is then placed within the cover, and after a light has been obtained, the matches are slipped out of the cover and the cover is closed.



A glass may be seen resting on a small magician's table. Into this is thrown a borrowed coin. The glass will now answer any questions because of the fact that the coin jumps up and down in it. Two leaps signify "yes" and one "no." A knitting needle passes through a hole in a glass. An assistant off-stage, operates the mechanism.



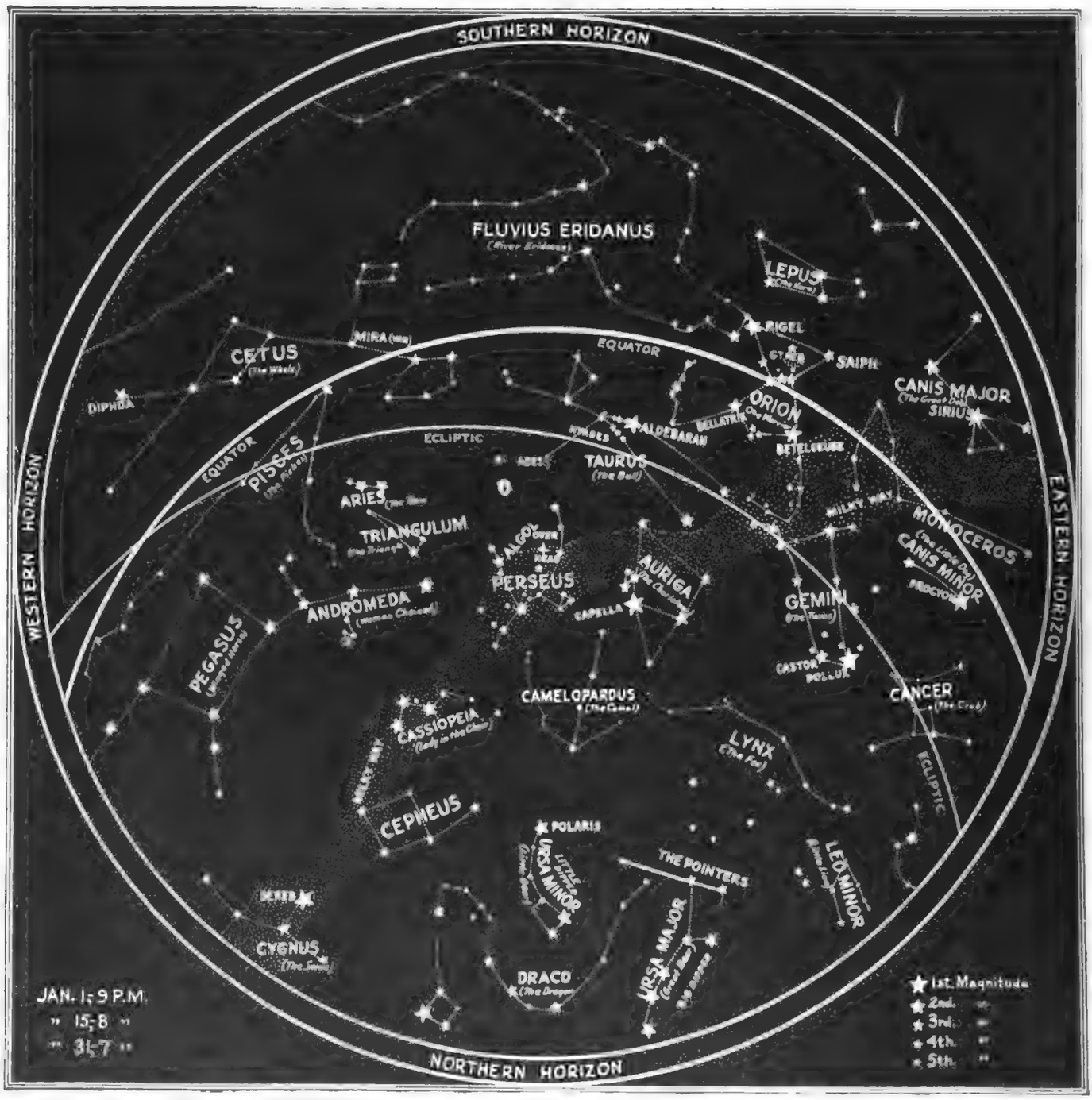
The performer takes a sheet of paper and rolls it up to form a tube. To demonstrate that it is empty, he holds a flashlight at one end, and permits the beams of light to pass through the tube. He drops the flashlight through it, and removes flags and ribbons from this empty tube in vast quantities. The flashlight is fitted with but one section of the usual battery. When the flashlight is dropped through the paper tube, the handkerchief container remains within it.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

The Heavens in January

By ISABEL M. LEWIS, M. A.

of the U. S. Naval Observatory



If this map is held over the head with the "Northern Horizon," north, the position of the stars in the heavens will coincide with their position on the map. It may be used any time during the month between 7 and 9 P. M., though at other hours and days than indicated the stars will have slightly different locations.

WINTER evening skies are the most brilliant of all the year. Seven stars of the first magnitude and more than twice as many of the second magnitude will now be found in the eastern sky. Ruddy Aldebaran in Taurus and golden Capella in Auriga are close to the meridian. The far-famed cluster of the Pleiades is due south of Perseus which is directly overhead at this time. The Hyades, another noted [illegible] in Taurus, lie a little to the southe[illegible]des. They are easily distin[illegible] distinctive V-shape and by [illegible]g one point of the V and [illegible]. Just to the south of A[illegible] the two stars, one of the second magnitude the other of the third. They mark the tips of the horns of Taurus.

Orion is now high in the southeast and no constellation in the heavens can rival the magnificance of this mighty celestial hunter. All of the principal stars in Orion, with the exception of the red giant star, Betelgeuse, of which we have heard so much in the past few years, are members of an associated group of stars that are involved more or less in a vast nebula that is probably about six hundred light years from the solar system. This great nebula is most strongly concentrated around the star Theta in the Sword of Orion which is a sextuple star, that is, it is made up of six stars in a connected system. Four of these—considerably brighter than the other two—form the well-known trapezium of stars in the heart of the Great Nebula. It is generally granted that there is no finer object in the heavens than this Great Nebula in Orion which can be seen to advantage even in a small telescope. It takes a powerful telescope, however, to reveal the branches and ramifications of the nebula that envelope the entire constellation in its folds.

Diagonally opposite to Betelgeuse is Rigel, a true diamond of the stars, and probably one of the super-giants of creation. It is an excessively hot and massive star of the us-

(*Continued on page* 916)

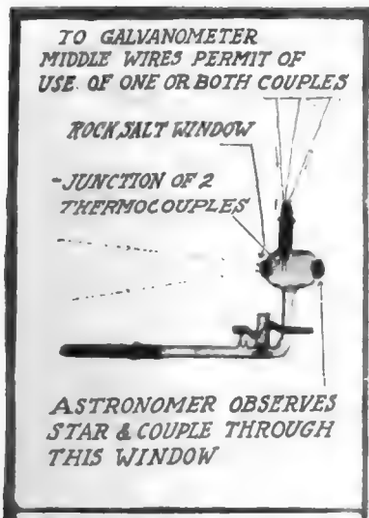
Digitized by Google

Original from UNIVERSITY OF CHICAGO

Measuring the Stars' Heat

Sensitive Thermocouple Creates Infinitesimal Current From Their Light.

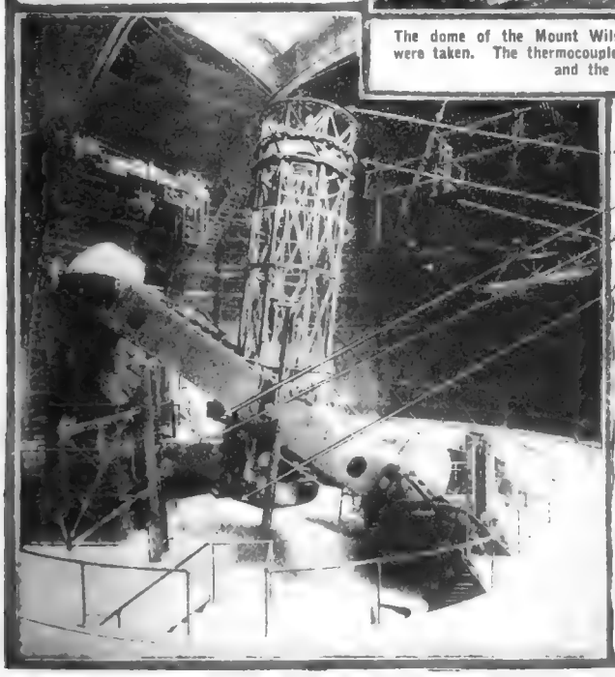
BY EDISON PETTIT,
Astronomer, Mt. Wilson Observatory


TO GALVANOMETER
MIDDLE WIRES PERMIT OF USE OF ONE OR BOTH COUPLES
ROCK SALT WINDOW
JUNCTION OF 2 THERMOCOUPLES
ASTRONOMER OBSERVES STAR & COUPLE THROUGH THIS WINDOW

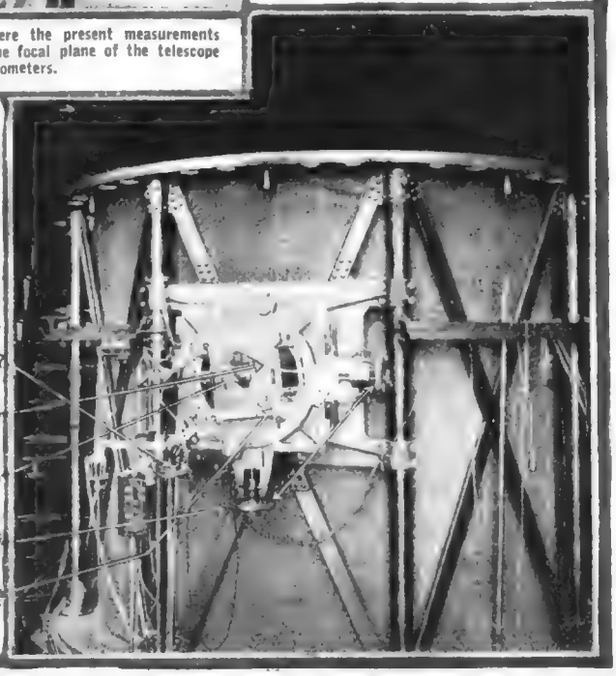
Above is the double thermocouple on which the star image falls for heat measurement.

The dome of the Mount Wilson Observatory where the present measurements were taken. The thermocouple was inserted at the focal plane of the telescope and the wires run to galvanometers.

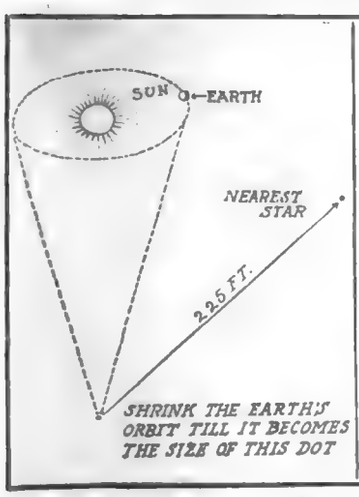
Top: Telescope eyepiece showing the thermocouple in place. Bottom: Wiring of double couple.

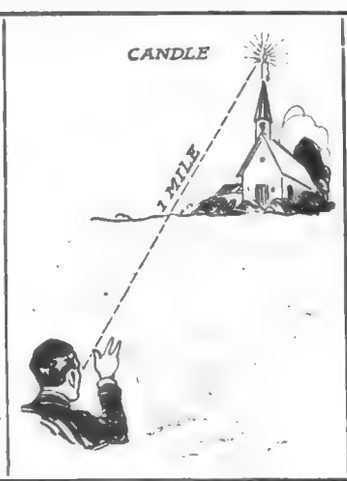


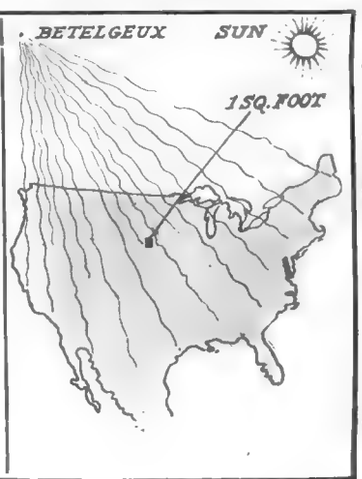
LIGHT FROM STARS ENTERS SKELETON TUBE HERE
FOCAL POINTS
PLATFORMS FOR OBSERVER
MIRROR 100" IN DIAMETER
TELEPHONE TO COMMUNICATE WITH OBSERVER AT GALVANOMETER IN BASEMENT
THERMOCOUPLE CABLE
EYE PIECE — THERMOCOUPLE ATTACHED BEHIND THIS.
LEVER FOR SHIFTING SCREEN FOR SPECTRUM
GUIDING HANDLE FOR THERMOCOUPLE



At the left below is shown the Hooker 100-inch reflecting telescope with which the present measurements were taken. The reflecting mirror is at the bottom of the skeleton tube. It is concave and focuses the beam of light to a point. The thermocouple is inserted at this point on movable supports. The couple is made in two parts and each part may be used separately, each deflecting the galvanometer in the opposite direction. Thus checking the results.







COMPARISONS

THE observer can see the thermocouple at all times. He focuses the point of light first on one junction of the couple and then on the other, the deflection in each case being in the opposite direction. Thus he checks each measurement. Above is shown the eye-piece of the telescope. The couple is placed directly behind it. The telescope is also equipped with a spectroscope, used with the couple, so the heat emitted by each color of the star's light may be measured.

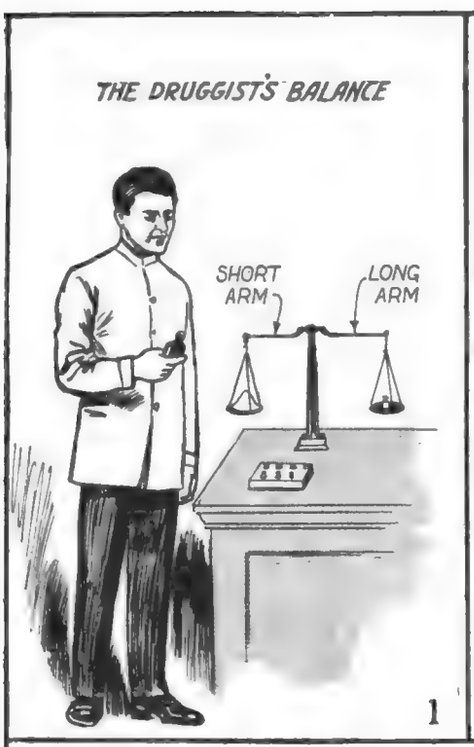
AT the left are shown comparisons of the heat from the stars that falls on the earth. If the whole orbit of the earth around the sun were shrunk to the size of a pin head, Alpha Centauri, the nearest star, would still be 225 feet away. Its heat has the same effect as the heat from a candle at the distance of a mile. If the heat from the star Betelgeux, absorbed by the United States were concentrated it would hardly equal the heat of the sun on one square foot of its surface.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Can You Answer These Problems?

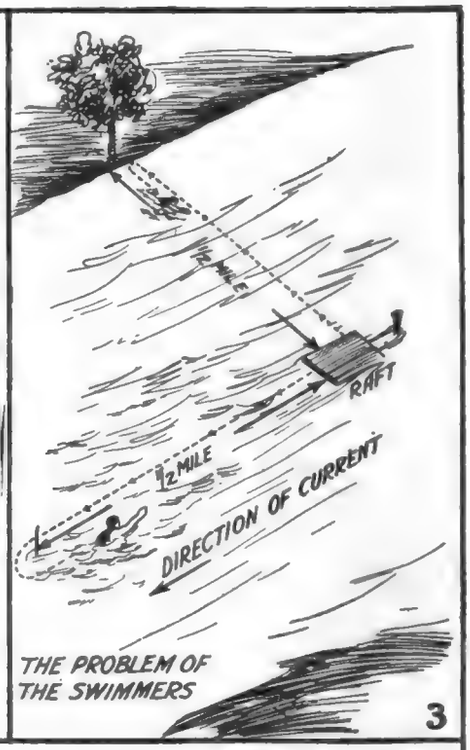
Everyday Scientific Problems Involving General Laws.

BY ERNEST K. CHAPIN, M. S.

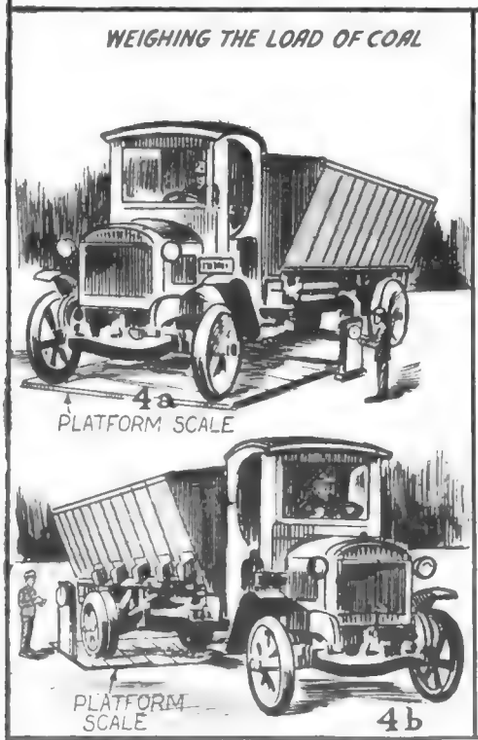


A certain druggist is accustomed to weigh his powders on a beam balance one arm of which is slightly longer than the other. Of this defect he is ignorant since the short arm is properly loaded by a set screw to make the beam balance. Suppose he places his weights just as frequently on one pan as on the other will he gain or lose on account of the defect?

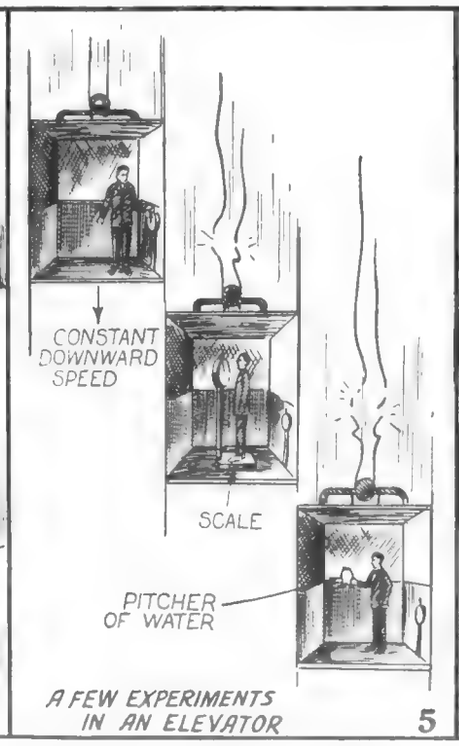
Take two balls, one of rubber and the other of solid glass. Release them from the same height and let them fall to a cement sidewalk, or better yet to a flat piece of sheet iron or other metal with an absolutely flat surface. Let them be of the same size. Which will bounce higher, the glass ball or the rubber one?



Two swimmers of equal strength and ability race across a river. One swims half a mile and returns across the river and the other swims half a mile down stream and returns. They start and finish from a raft in mid stream. If they are of equal power and of equal skill as swimmers which should win the race. Both are forced to combat the current of the stream.



A man wishes to weigh a load of coal but finds that the platform of the scales is too short to accommodate the whole wagon. He decides to obtain the weight of the front wheels on the platform and the rear wheels on the platform. The sum of the two thus obtained, he figures, should be the weight of the load. Is he correct in this assumption?



Suppose an elevator drops quietly and at constant speed, could an individual tell if it were in motion? Suppose a man in the elevator stood on a weighing scale when it started to drop, what would be the result? Suppose the elevator were dropping at the speed due to the action of gravity, what would happen if a pitcher of water were inverted in the cage?

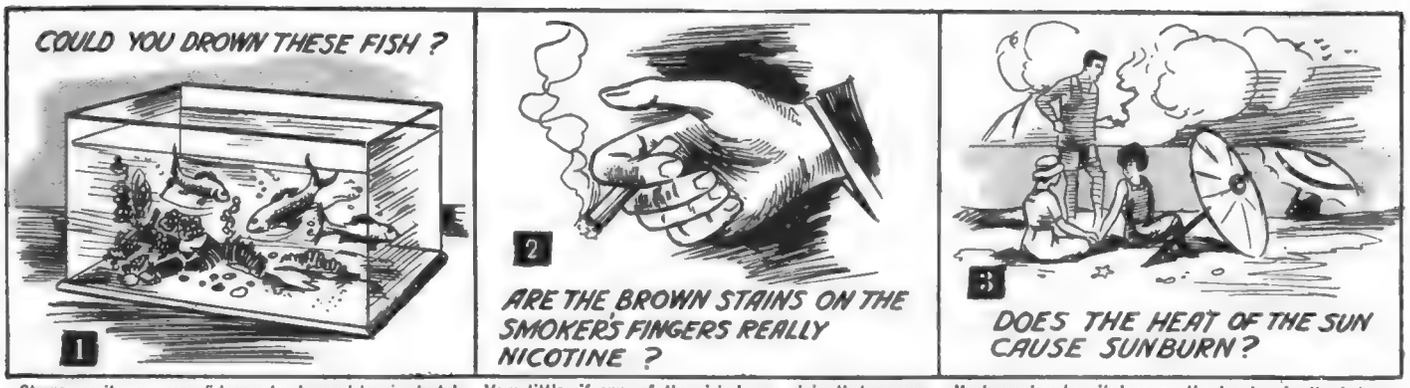
It is said that if hard boiled eggs are immersed in a bath of cold water immediately after they come out of the boiling kettle they will be much easier to peal. Is there any scientific foundation for this fact? Is it actually the case?

ANSWERS TO THESE QUESTIONS AND THEIR EXPLANATIONS WILL BE FOUND ON PAGE 929.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Scientific Misconceptions

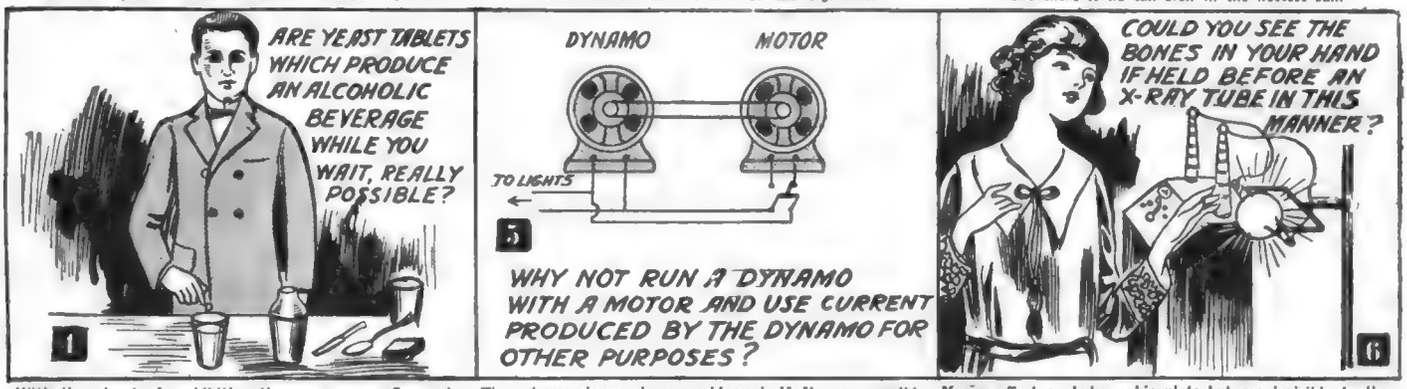
BY RAYMOND B. WAILES.


COULD YOU DROWN THESE FISH ?
1
ARE THE BROWN STAINS ON THE SMOKER'S FINGERS REALLY NICOTINE ?
2
DOES THE HEAT OF THE SUN CAUSE SUNBURN?
3

Strange as it may seem, fish may be drowned by simply taking the dissolved air out of their aquarium. This can be done by boiling the water and then cooling it. It is because of the necessity of dissolved air in the water that a stream of fresh water or a jet of air is forced into artificial fish ponds where there are numbers of fish.

Very little, if any, of the rich brown stain that appears on smokers' fingers is nicotine. The stain is composed chiefly of tar as formed by the burning of the carbon in the cigarette. Nicotine is a deep brown oily substance but there is little of it that is not volatilized with the extreme heat at the end of the cigarette.

Most people who sit long on the beaches in the hot sun think that it is the solar heat that causes the tan, or sun-burn, as it is called. The effect is caused by the ultra-violet rays in the sunshine and not by the extreme heat. This is proved by the fact that if these rays are filtered out there is no tan even in the hottest sun.


ARE YEAST TABLETS WHICH PRODUCE AN ALCOHOLIC BEVERAGE WHILE YOU WAIT, REALLY POSSIBLE?
4
DYNAMO
MOTOR
TO LIGHTS
5
WHY NOT RUN A DYNAMO WITH A MOTOR AND USE CURRENT PRODUCED BY THE DYNAMO FOR OTHER PURPOSES ?
COULD YOU SEE THE BONES IN YOUR HAND IF HELD BEFORE AN X-RAY TUBE IN THIS MANNER ?
6

With the advent of prohibition there were many firms who claimed to manufacture yeast tablets that could be dropped in a drink and would produce alcohol content "while you wait." This is impossible as it takes some time for the live yeast organism to perform its work of making alcohol from the sugar in the drink.

The scheme shown above would work if it were possible to manufacture a dynamo and a motor that were mechanically and electrically perfect. The loss in friction takes between ten and twenty per cent of the power of the two machines. Aside from this loss, the machines cannot be made electrically perfect.

X-rays affect a photographic plate but are invisible to the naked eye. In order to get their penetrating effect, i.e., to see the bones in the hand with the aid of an X-ray tube, it would be necessary to use a fluoroscope screen between the eyes and the hand. This screen would show the effect of the rays.

IS A "BRASS" PIN POISONOUS IN REMOVING SPLINTERS ?
7
YELLOW SOAPS ARE CALLED ROSIN SOAPS-
DOES IT MEAN THAT ROSIN IS USED AS AN ADULTERANT?
8
DOES SALT THROWN ON A FIRE CAUSE IT TO BURN VIGOROUSLY?
9

A brass pin or needle is no more poisonous to the body than a steel one. The danger in both cases arises from the use of an unsterilized pin which may have micro-organisms on the point which is used to prick the splinter or to open the blister. These organisms cause the infection, not the nature of the metal used.

Many of the heavy yellow soaps have a comparatively high resin content. This element used in the manufacture of the soap is not, as is sometimes thought, used as an adulterant. Its addition causes the soap to produce a rich, highly detergent lather that is very useful in dissolving greases and oils.

When it is wished to make a fire blaze up freely, salt is sometimes thrown into the flames to cause the effect. The Bureau of Mines, in a recent series of tests, has conclusively proven that the flare-up following the dosage of salt is simply a result of the sodium flame and not because of a better burning fire.

10
WHY DOES AN OIL LAMP GIVE BETTER LIGHT WITH THE CHIMNEY ON?
WHAT MAKES A COLD GLASS CRACK IF HOT WATER IS POURED INTO IT?
11
WHAT CAUSES THE SOUND WHEN A SEA-SHELL IS HELD TO THE EAR?
IS IT AN ECHO OF THE WAVES OF THE SEA?
12

The lamp burns much brighter with the chimney because the chimney causes a draft which allows the carbon to be more highly heated giving a brighter flame.

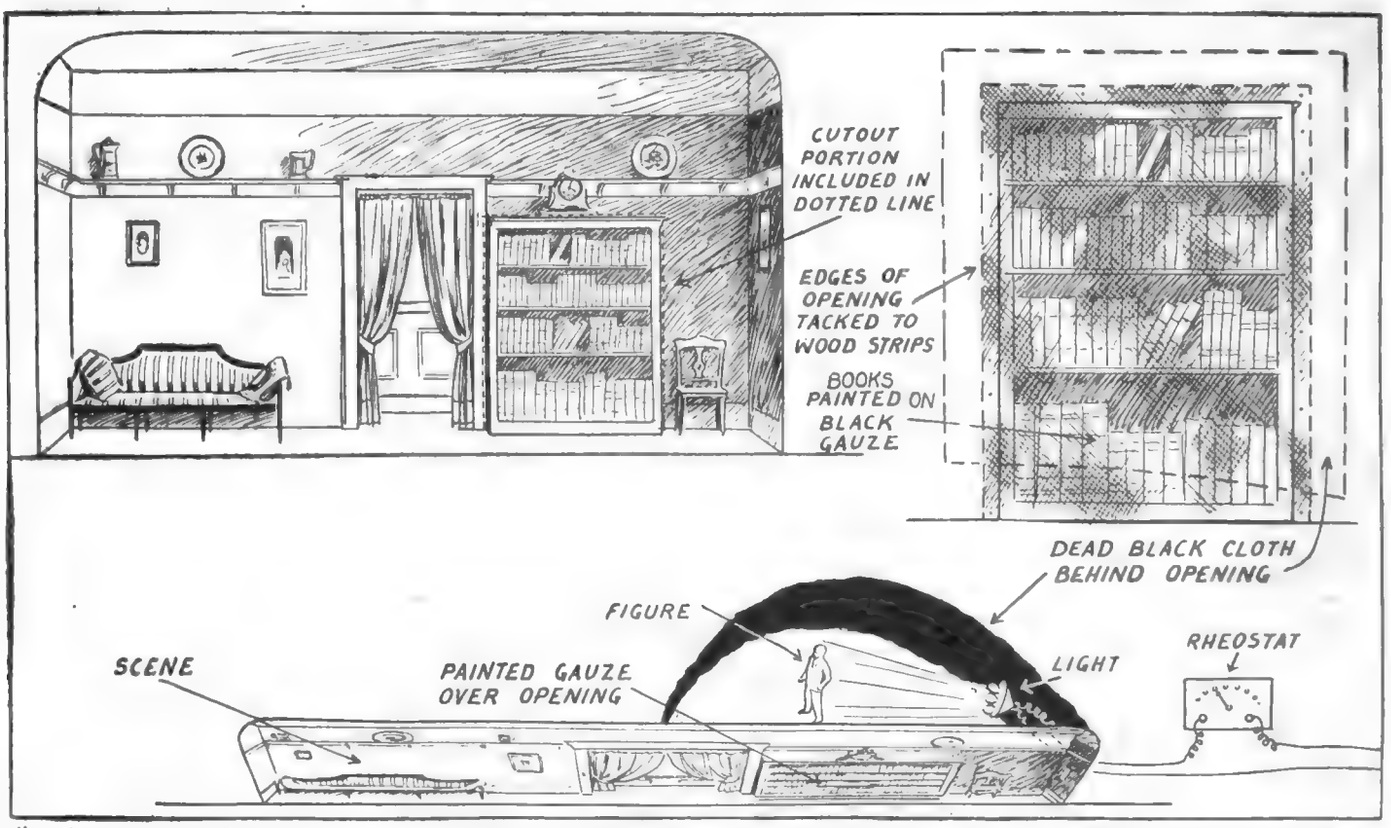
A glass breaks when hot water is poured into it because of the difference of expansion between the outside and the inside due to the higher heat on the inside.

A sea shell sounds when held to the ear simply because its form magnifies the sounds of the room and pulses in the head. The least vibration causes an "echo."

Digitized by Google
Original from UNIVERSITY OF CHICAGO

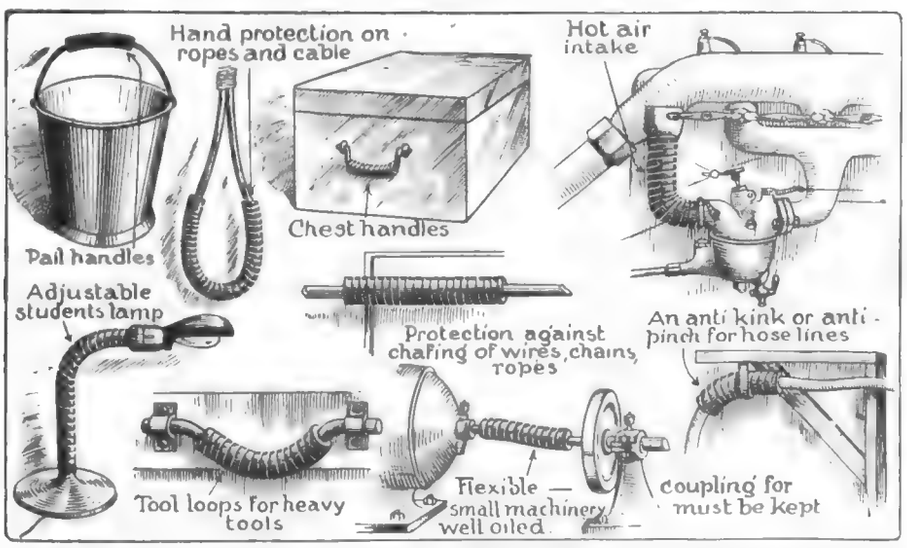
THE CONSTRUCTOR

Ghost Spectacle for Amateur Stage



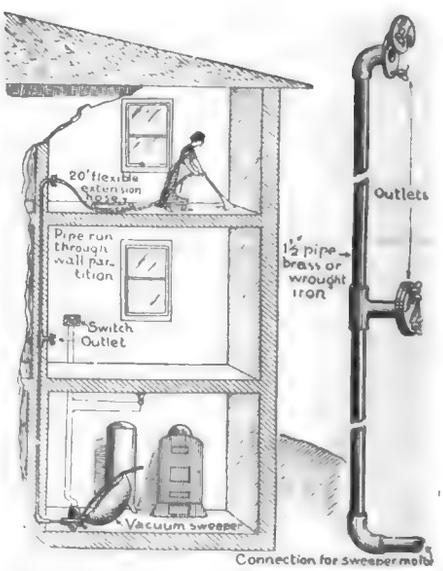
Many times amateur productions on the stage are put to it to show a ghost or apparition. A simple method of creating the illusion is to take a spot in the back drop, say a book case, cut out the regular canvas upon which it is painted and substitute theatrical gauze. Paint the same piece of furniture on the gauze and drop a solid black drop behind it. When the apparition is supposed to appear it is only necessary to place the figure behind the gauze, darken the stage lights and throw light on the figure. Thus the figure is seen through the piece of furniture. He disappears when the lights are turned up, and the light is taken off the figure.—L. B. Robbins.

USES FOR SCRAP CONDUIT


Hand protection on ropes and cable
Hot air intake
Chest handles
Pail handles
Adjustable students lamp
Protection against chafing of wires, chains, ropes
An anti kink or anti-pinch for hose lines
Tool loops for heavy tools
Flexible — small machinery well oiled
coupling for must be kept

All amateur electricians are confronted with the problem of disposing of scrap bits of conduit. Amateurs do not like to throw away anything—that's why they are amateurs. Above is shown some of the many ways scraps of flexible conduit, too short to use in regular wiring, may be put to use. Any number of handles may be made by placing short strips of the flexible metal over stiff wire or cord. If there is a piece of larger diameter available it will be found very handy in constructing a hot air [illegible] for the carburetor of the car. If a couple of the end fittings are handy, a very presentable study lamp can be m [illegible] —C. R. Mullin.

CLEANER KINK



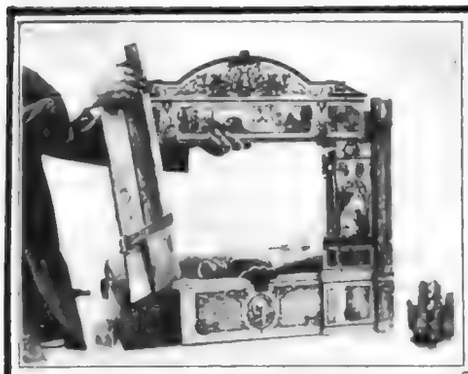
By passing a pipe line up through the partitions of a house and fitting it with plugs on each floor and attaching it to the vacuum cleaner in the basement and using a hose with a nozzle time can be saved.—G. A. Luers.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

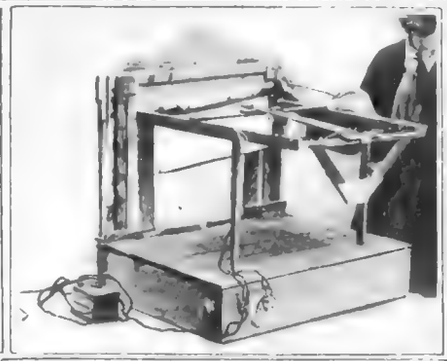
Stage Effects for Miniature Theatre

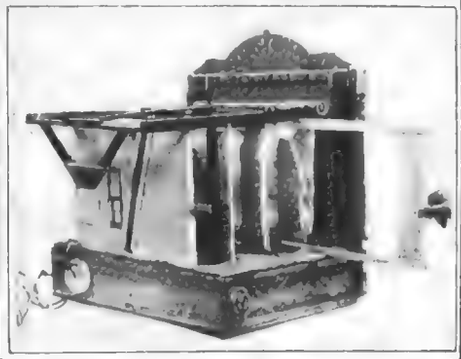
Miniature Theatre in Which Wonderful Effects Can Be Worked.

BY DR. ERNEST BADE.

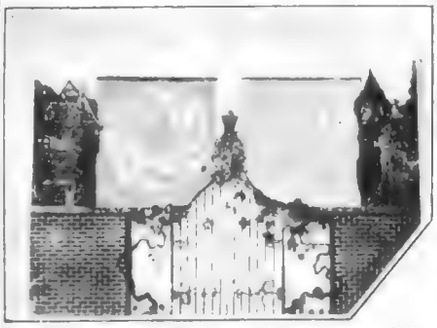


All of the parts of the electrically operated toy stage shown above are found in the box. This is hinged at one end and grooved on top, so that the various scenes can be slid in and out. The proscenium consists of four separate pieces.

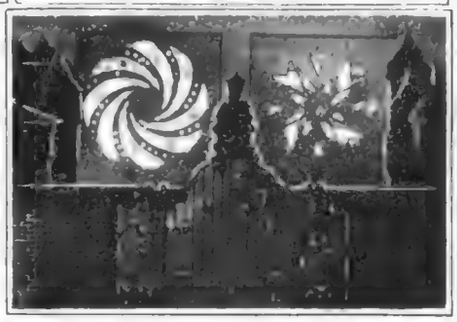


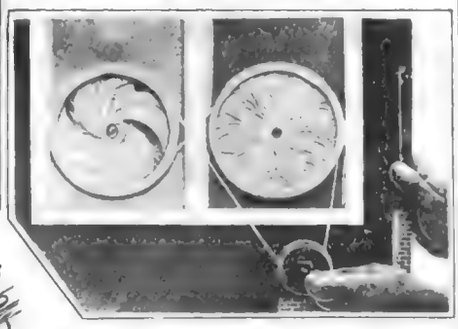


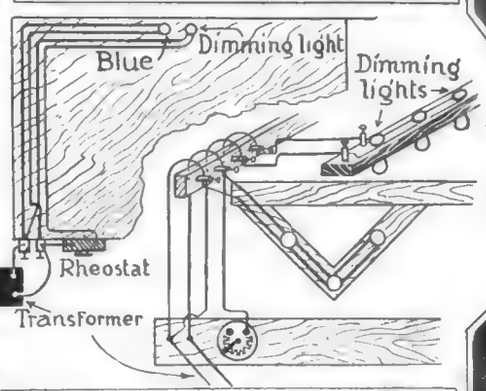
Back stage two T-shaped pieces of wood containing four deep grooves are erected. At the rear a V-shaped piece of wood, having several miniature incandescent lights mounted upon it, may be seen. The back drop is the most important part of the scene.



One of the scenes as it appears from the front of the stage with the footlight turned on fully. These scenes can be made from paper cut-outs, Sunday supplements or other art pictures. The dimming light is then turned low by means of the rheostat, which causes the front stage illumination to be produced entirely by the blue light. A beautiful firework scene is now in evidence, and the surprising feature is that it moves and is colored.

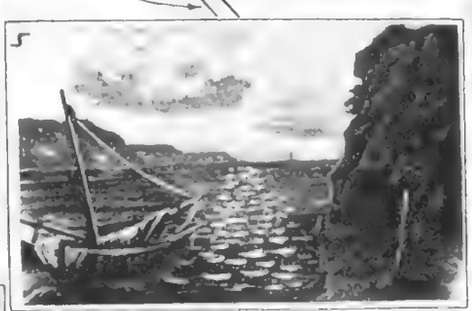


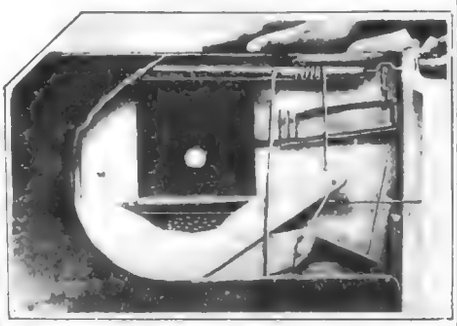




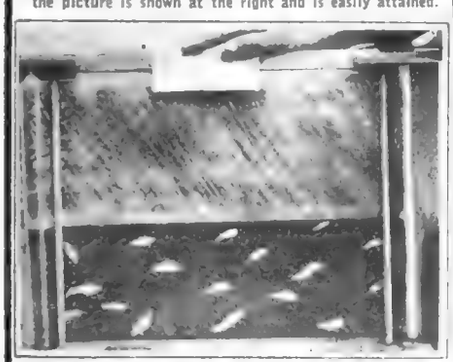
Two cardboard wheels are cut out as illustrated above, and covered by tissue paper which has been colored with crayon pencils, are rotated by means of the small driving wheel also made of cardboard. A cord belt connects the three wheels as shown. When illuminated from behind, the effect is startling. The circuit diagram is shown at the left.

Even the picture shown above can be employed in this miniature theatre, in which the curtain rolls up and down for each change of scenery. The night effect of the picture is shown at the right and is easily attained.



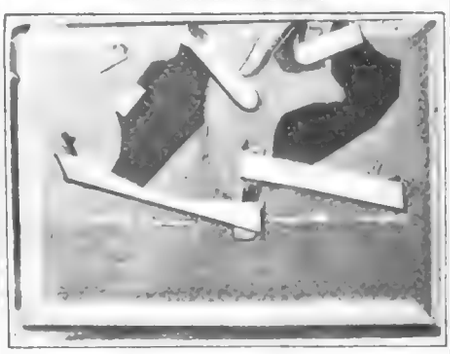


The manner in which the effect is produced is here illustrated. The rising moon is merely a hole cut in a roller curtain. The waves are cut into black cardboard which rocks back and forth.



Those portions of the scene which are to be illuminated from behind, are generally made of thin paper. Above is a night ocean effect. As the roller curtain is moved from one end to the other, the waves move and the rain pours down.

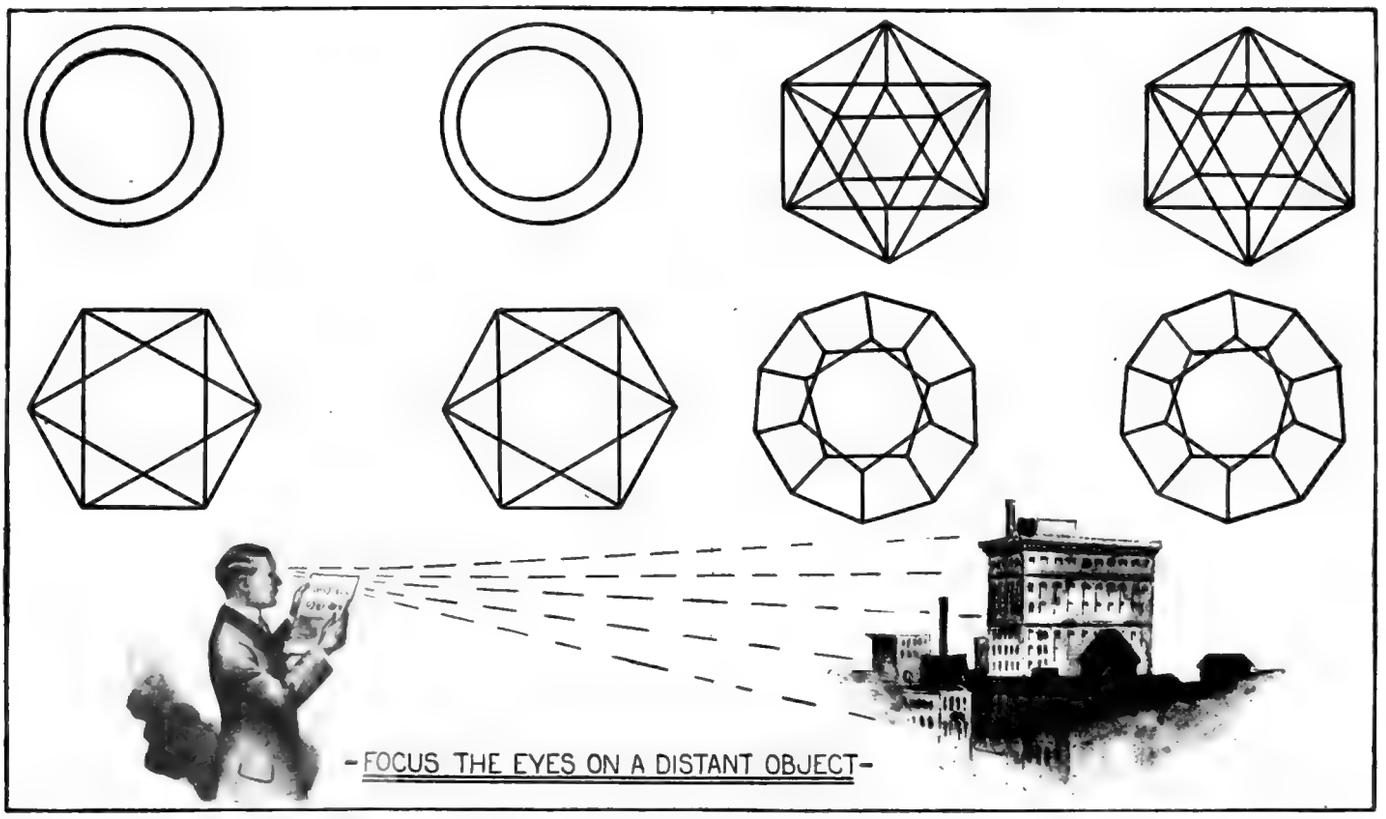
Another back view in which the tissue paper part of the scene is clearly shown. This is a rising sun effect over a lake. The method of producing wave ripples simulating reflection upon water is effected by rocking the wave device back and forth.



In the back scene effect illustrated above, lightning flashes through a dense forest. The lightning flash cut into the picture, is clearly illustrated. The shutter merely cuts off the rays of light.

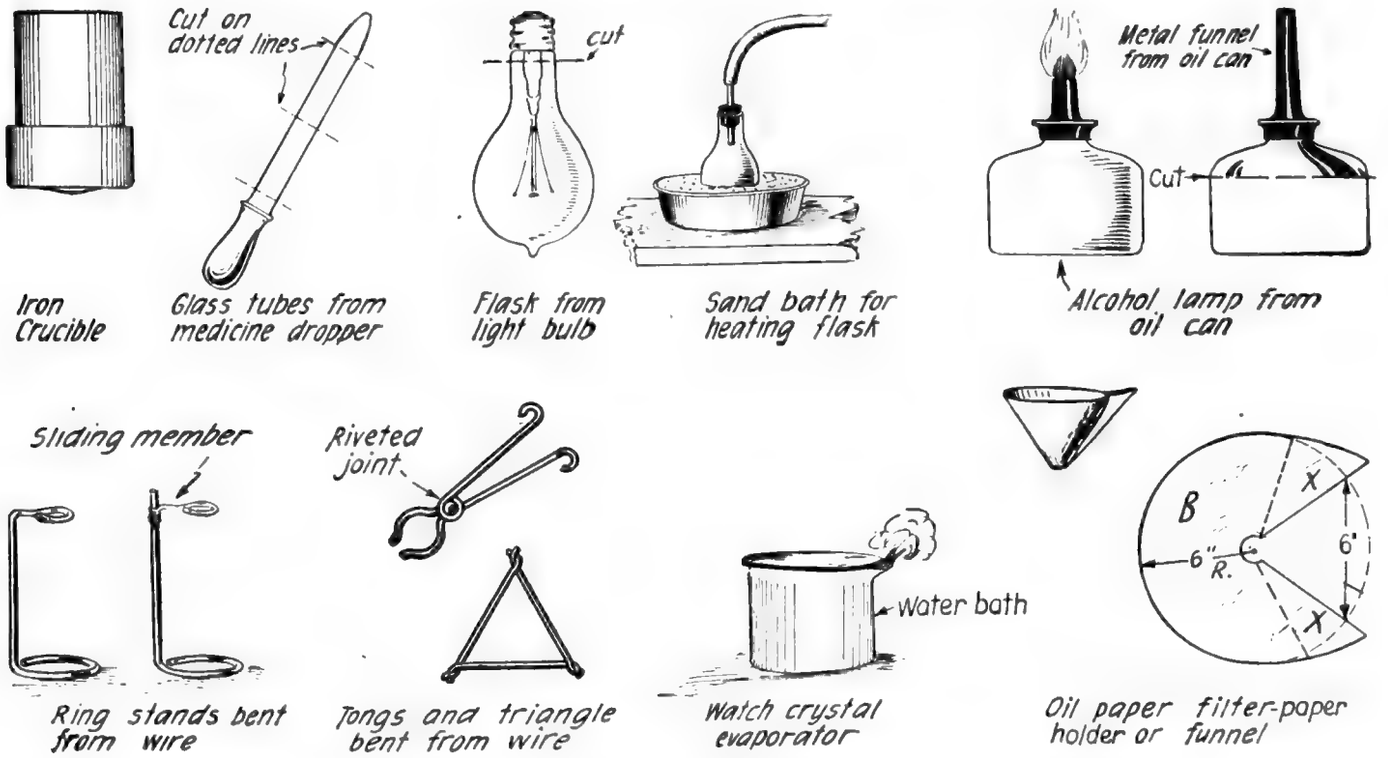
Digitized by Google
Original from UNIVERSITY OF CHICAGO

Stereoscopic Drawing Method



The making of relief drawings is a comparatively simple matter. As shown above, it is only necessary to make duplicates of the drawings, offsetting that part of the image that is to appear on the left side of the completed drawing a little to the left and that part of it which is to appear in the right side a little to the right. If the above drawings are held in the plane of the eyes at the regular reading distance and the eyes are then focused at some distant point they will stand out in stereoscopic relief.—Ernest K. Chapin.

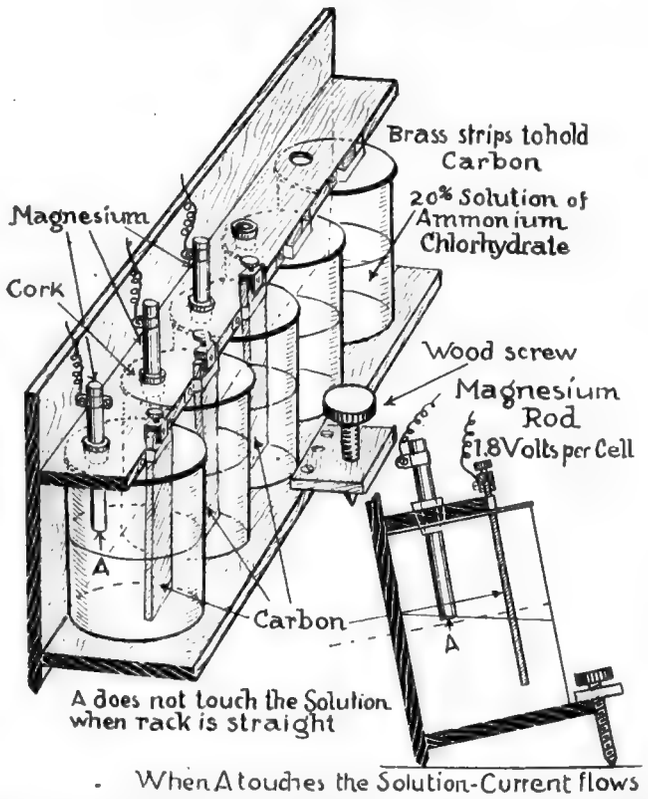
Home-Made Laboratory Equipment



Many r… …ng away from the larger cities encounter much trouble in getting the k… …ssary for their experiments at a reasonable cost. Above are show… …e experimenter may manufacture his own apparatus from mate- ria… …iron crucible is made from a short length of pipe and a pipe cap. Short lengths of glass tubing may be made from ink droppers. A serviceable flask is made from a large light globe. An alcohol lamp and funnel is made from an oil can. Ring stands, triangles and tongs are made from stiff wire. Filter paper holder is made from waxed paper.—Charles D. Tenney.

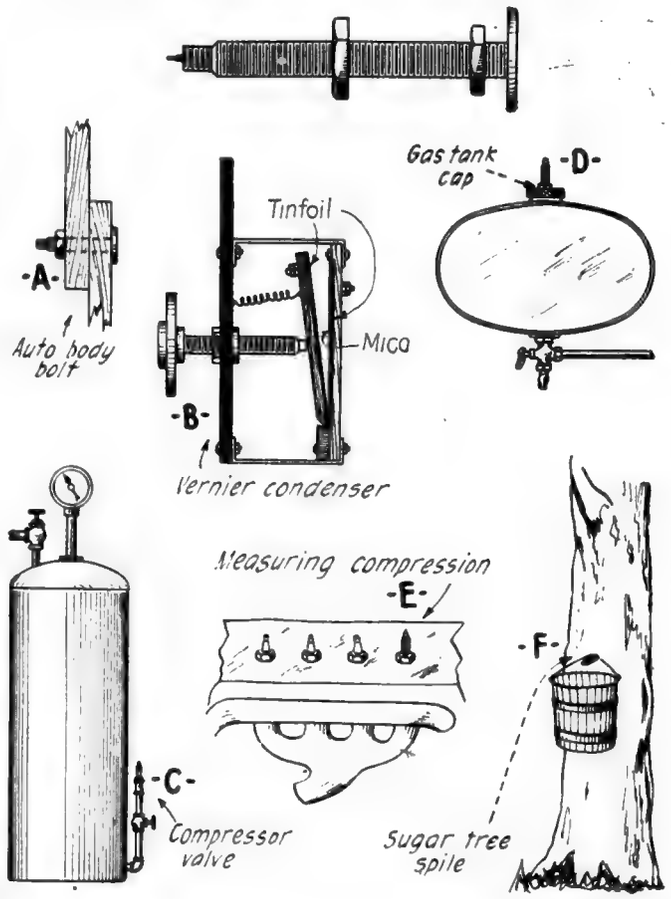
Digitized by Google
Original from UNIVERSITY OF CHICAGO

Novel Wet Cell



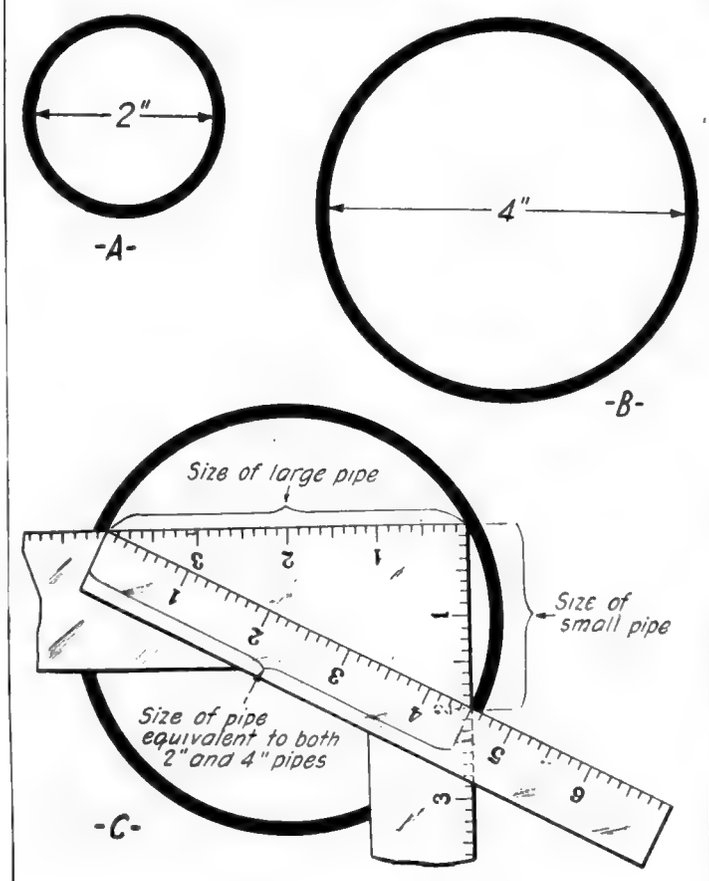
A simply constructed battery that will deliver 1.8 volts per cell. It is constructed of carbon and magnesium rods in Ammonium Chloride. The thumb-screw takes the magnesium out of the solution when the cell is not in use.—Chas. Mohr.

Uses for Valve Cores

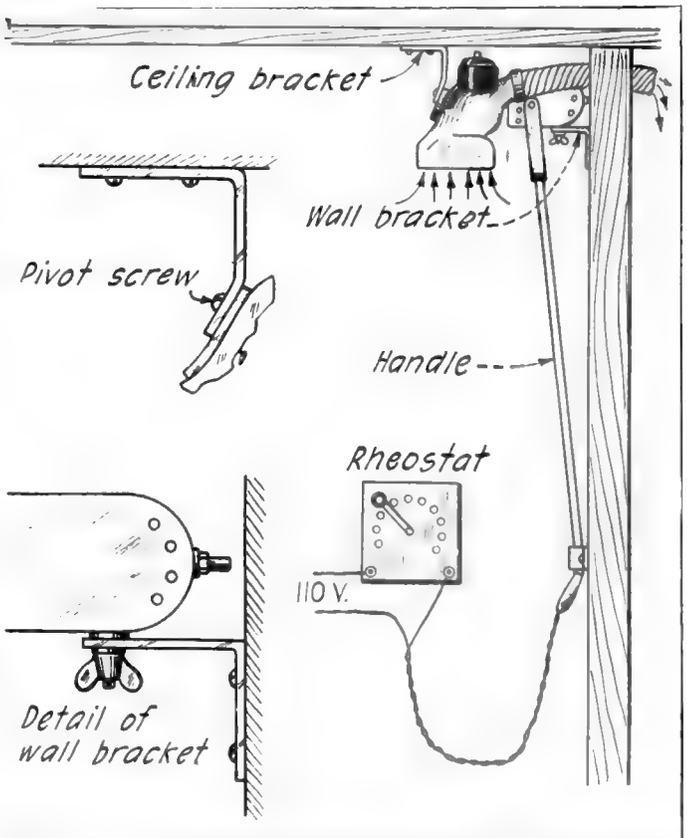


At the right are shown several uses for discarded valve stems. A—As a bolt. B—As an adjustment screw for book-type variable condenser. C—As an intake valve for a compressed air tank. D—As an air valve in the top of the fuel tank. A few strokes of the pump helps the car over the hill. E—Compression tester. F—Sugar tree spile.—J. T. Garver.

Pipe Size Changes



Vacuum Cleaner Use



At the left is shown a simple method of finding a large pipe that will carry the same amount as two smaller pipes and vice versa.—Geo. G. McVicker. Above is shown a method of using the vacuum cleaner to force fresh air into rooms where ventilation is impracticable by ordinary methods, such as dark rooms.—L. B. Robbins.

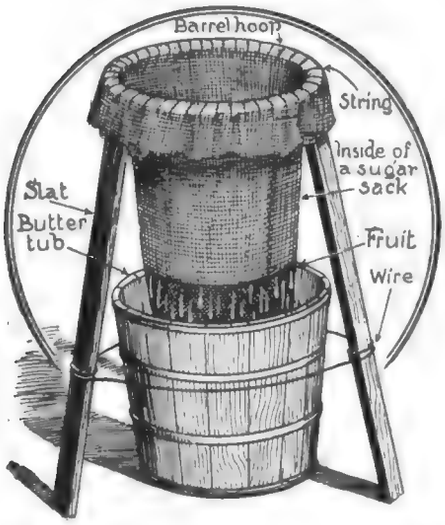
Digitized by Google
Original from UNIVERSITY OF CHICAGO

WRINKLES
RECIPES & FORMULAS

Edited by S. GERNSBACK

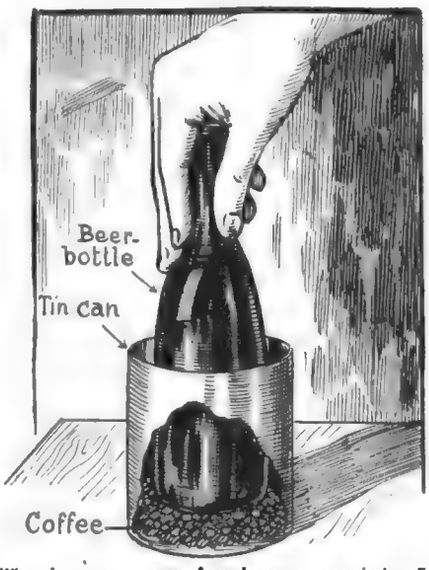
FOR PRIZES PAID SEE PAGE 856.

Fruit Strainer



A very cheap strainer for fruit juices is made by stitching a sugar sack to a barrel hoop and supporting it on three slats over a butter tub, as shown in the sketch above. Wires hold the slats in place. —Mrs. Florence Swallow.

Coffee Grinder

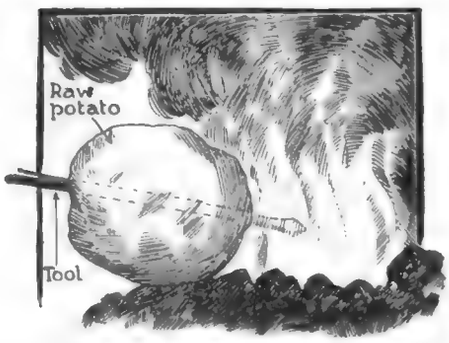


When in camp or away from home, a convenient coffee grinder is made with a beer bottle and a large can, as shown in the above sketch. —I. D. Burkett.

Cork Screw

When the cork screw is lost or misplaced try using a large sized wood screw in its place. If the screw is passed through a wooden handle it works better. —B. Willard.

Tempering Tools

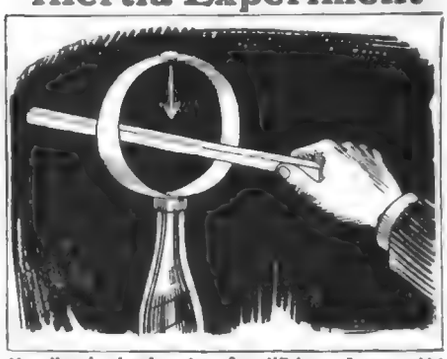


To keep the heat from running too far up a small tool when tempering it, insert it in a raw potato. —W. A. Kyle.

"Silvered Egg"

If an egg is thoroughly blackened in a flame and dropped in water it takes an iridescence like silver.—Ethel Amine.

Inertia Experiment



If a dime is placed on top of a stiff hoop of paper which rests on a bottle top as shown, and the hoop removed by a quick sidewise blow the dime falls in the bottle.—B. Zyl.

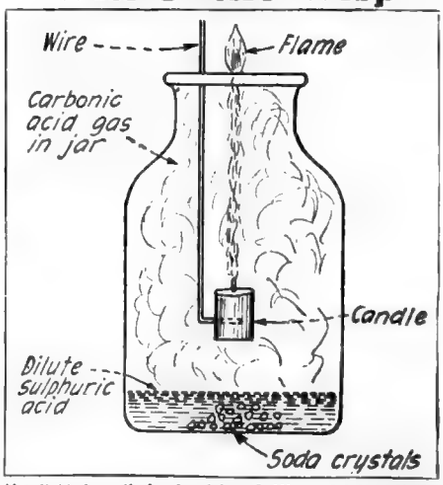
Pin Hole Vision

With a pencil point punch a small hole in a bit of paper. Small print may be read through it easily.—J. N. Morrison.

Dancing Wire

If two glasses are filled with water so that they emit the same musical note and a short bit of wire is placed atop one of the glasses and the other is caused to sound the musical note by rubbing its top with resined fingers the wire on the other glass will be found to dance. This is due to the fact that both glasses vibrate in unison to the musical note sounded. If a violin is handy and the same note is struck on the violin and wires are placed on top of both glasses they will both vibrate. —P. Rolatom.

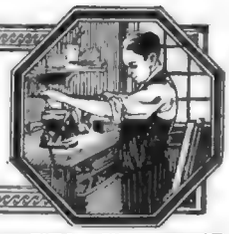
Will-o'-the-Wisp



If a lighted candle is placed in a bottle containing solution as shown above, a flame will burn on top of the bottle as long as the candle remains hot. —C. A. Oldroyd.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

HOW-TO-MAKE-IT

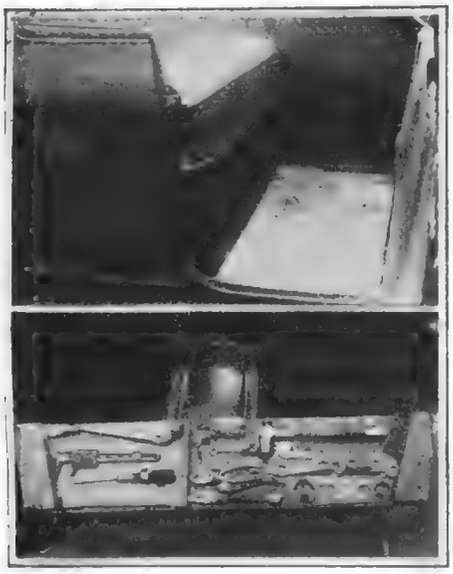


This department will award the following monthly prizes: First prize, $15.00; second prize, $10.00; third prize, $5.00.

The purpose of this department is to stimulate experimenters toward accomplishing new things with old apparatus or old material, and for the most useful, practical and original idea submitted to the Editors of this department a monthly series of prizes will be awarded. For the best idea submitted a prize of $15.00 is awarded; for the second best idea a $10.00 prize, and for the third best a prize of $5.00. The article need not be very elaborate, and rough sketches are sufficient. We will make the mechanical drawings. Use only one side of sheet. Make sketches on separate sheets.

Auto Tool Kit

FIRST PRIZE $15

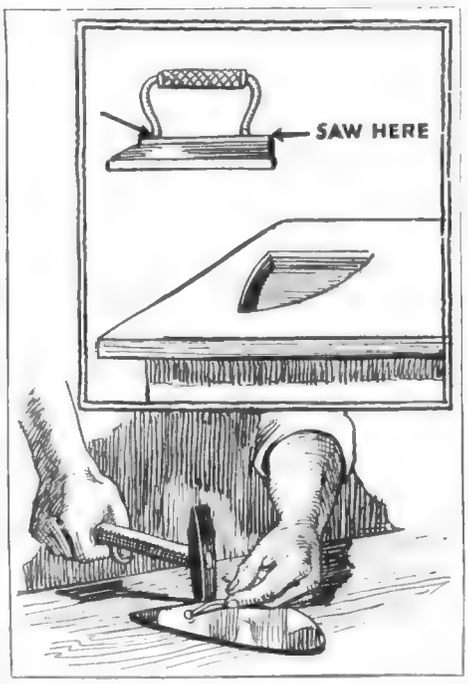


A few strokes of the hammer and saw will save the trouble of digging the hammer and the rim wrench out from under the back seat and untangling them from the skid chains if the above shown idea is put into practice. A short length of board is sawed to fit the space under the front seat cushion. It is then equipped with metal clips to hold the tools. —John Blank

[If author will send address, prize will be forwarded.—EDITOR.]

Bench Anvil

SECOND PRIZE $10



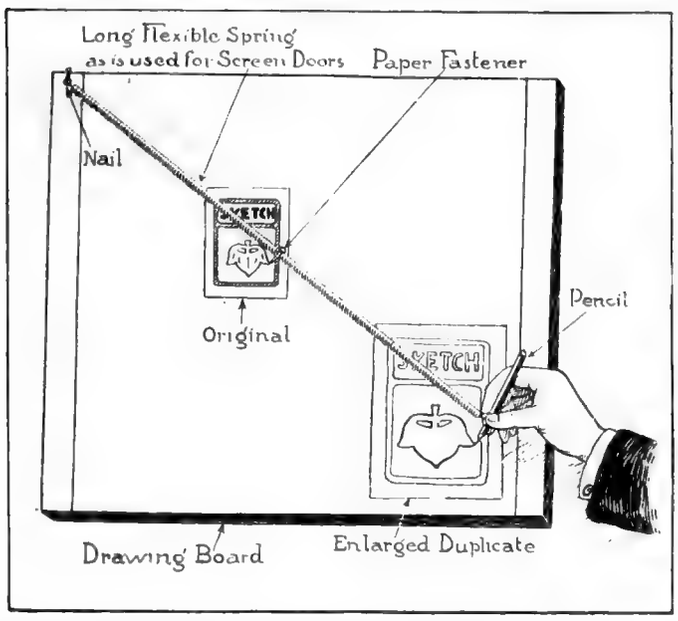
By sawing the handles off an old flat-iron and cutting a receptacle to fit the body of the iron on the work bench a very useful bench anvil is made. —Chas. T. Allen.

Spoon Teacher

THIRD PRIZE $5

For those children who seem prone to use the left hand in spite of the daily admonitions of mother and father the little device shown in the above sketch will do more to teach them the correct usage than all the scoldings the parents can hope to give. It is only necessary for the father to bend one of the old teaspoons in the shape shown above. The shape makes it impossible of use except with the right hand. The small part of the spoon handle is heated over a gas jet and the bowl of the spoon bent at right angles and to the left. —Otto A. Koehler.

Coil Spring Used for Enlarging



A long, flexible spring, such as the type used to hold screen doors in check, may be used to make enlargements of drawings by the process shown in the sketch above. A stout nail is fixed in one corner of the drawing board and a pencil stub or paper fastener is placed in the center of the spring as an indicator. The drawing pencil is then attached to the other end and used as shown. —G. A. Luers.

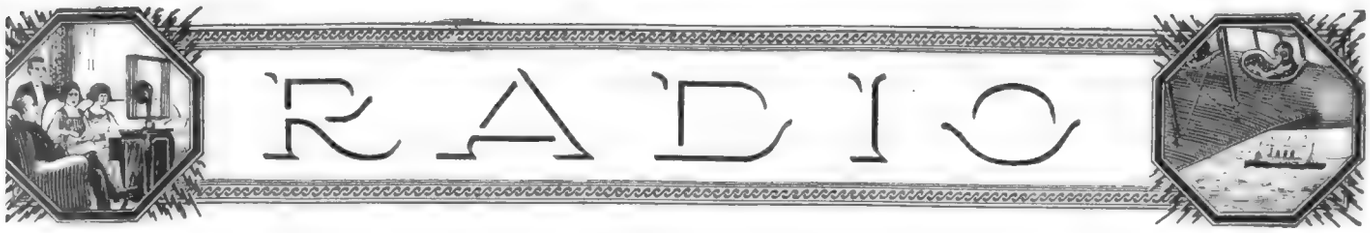
Universal Indicator for Poison Bottles

The young lady to the right is putting the sandpaper on the bottles. Note that most of the body of the bottle is covered, so that the warning is certain.

Any number of schemes for marking poison bottles have been suggested to this department in times past. This scheme seems, however, to be one of the best submitted since it is easily installed and will lead to no discomfort to the person grasping the bottle as is the case with some of the ideas submitted. It is also obvious that it is practically impossible to touch the bottle without receiving the warning as to its contents.

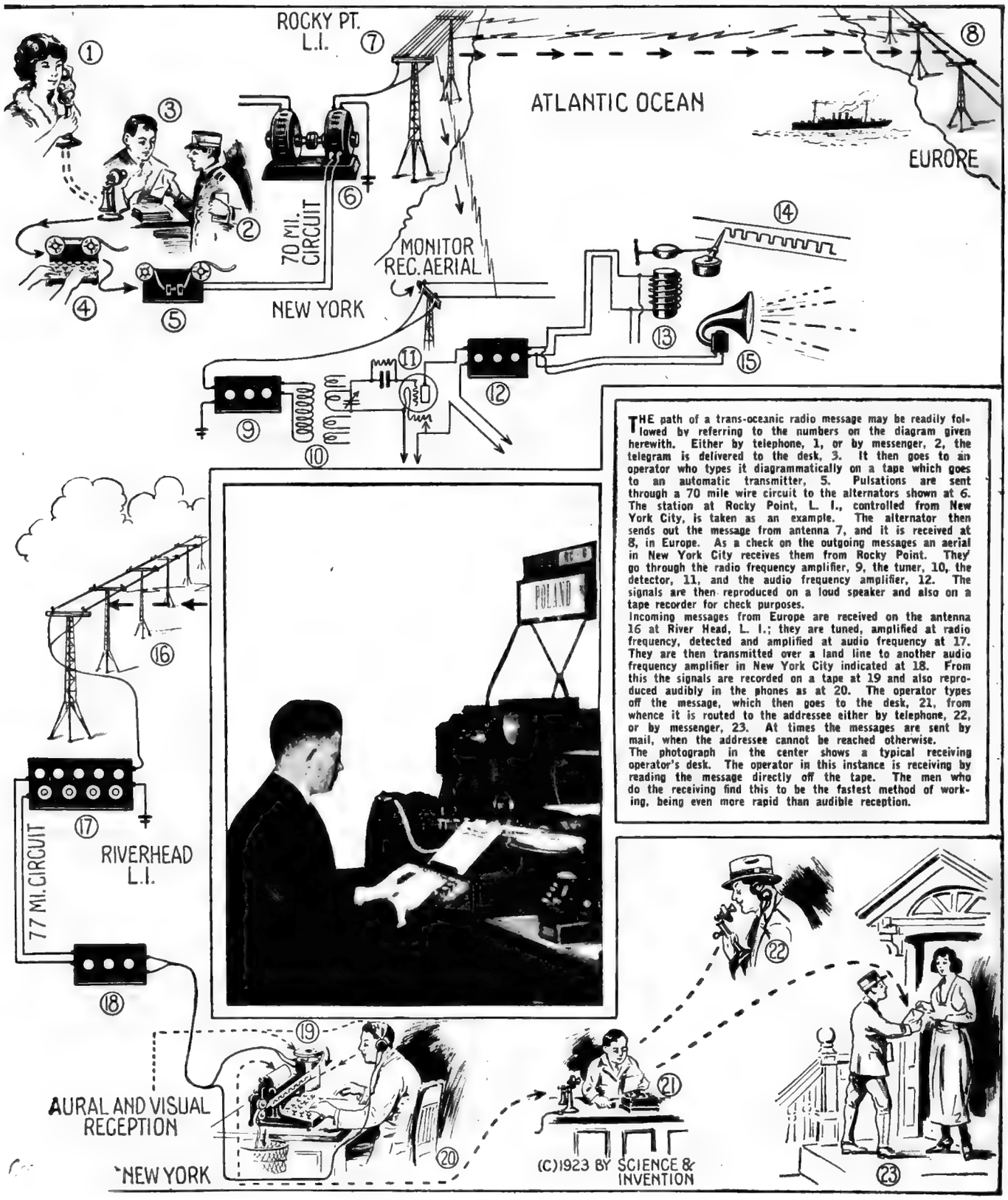
By the simple means of pasting a strip of sand paper over the face of bottles containing poisons the danger of getting the bottle by mistake on account of darkness is eliminated. The flint paper is pasted clear around the bottle. —Nelson Edwards.

Digitized by Google
Original from UNIVERSITY OF CHICAGO



Path of Trans-Atlantic Radio Message

How Messages Are Handled by World's Largest Radio Stations.



THE path of a trans-oceanic radio message may be readily followed by referring to the numbers on the diagram given herewith. Either by telephone, 1, or by messenger, 2, the telegram is delivered to the desk, 3. It then goes to an operator who types it diagrammatically on a tape which goes to an automatic transmitter, 5. Pulsations are sent through a 70 mile wire circuit to the alternators shown at 6. The station at Rocky Point, L. I., controlled from New York City, is taken as an example. The alternator then sends out the message from antenna 7, and it is received at 8, in Europe. As a check on the outgoing messages an aerial in New York City receives them from Rocky Point. They go through the radio frequency amplifier, 9, the tuner, 10, the detector, 11, and the audio frequency amplifier, 12. The signals are then reproduced on a loud speaker and also on a tape recorder for check purposes.

Incoming messages from Europe are received on the antenna 16 at River Head, L. I.; they are tuned, amplified at radio frequency, detected and amplified at audio frequency at 17. They are then transmitted over a land line to another audio frequency amplifier in New York City indicated at 18. From this the signals are recorded on a tape at 19 and also reproduced audibly in the phones as at 20. The operator types off the message, which then goes to the desk, 21, from whence it is routed to the addressee either by telephone, 22, or by messenger, 23. At times the messages are sent by mail, when the addressee cannot be reached otherwise.

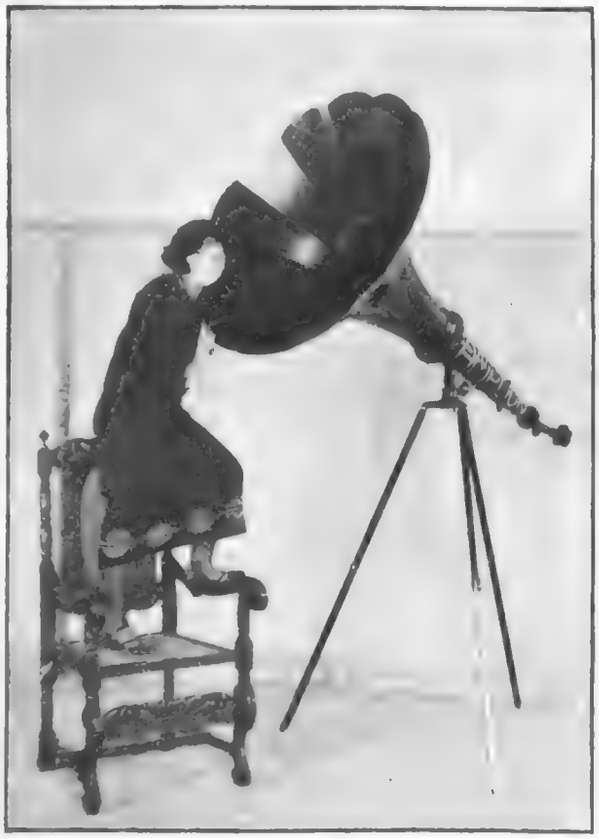
The photograph in the center shows a typical receiving operator's desk. The operator in this instance is receiving by reading the message directly off the tape. The men who do the receiving find this to be the fastest method of working, being even more rapid than audible reception.

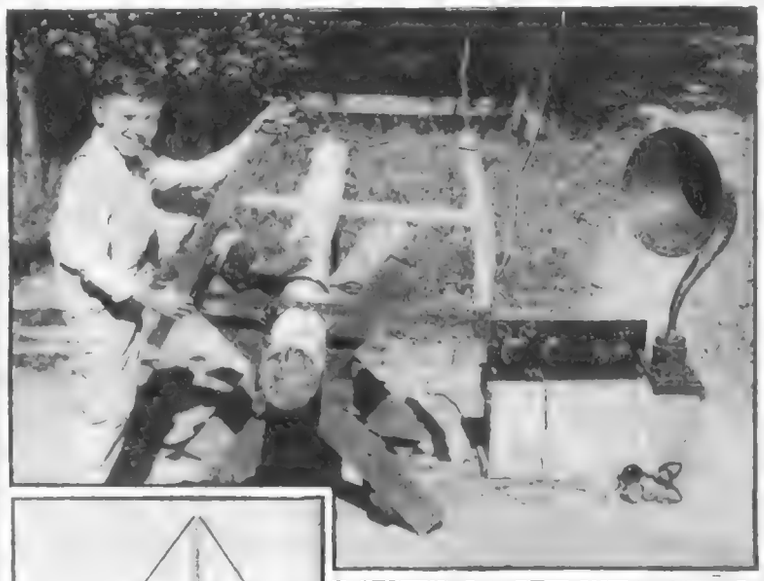
Digitized by Google
Original from UNIVERSITY OF CHICAGO

The Radio Invasion Continues

Its Entertainment Goes Everywhere.

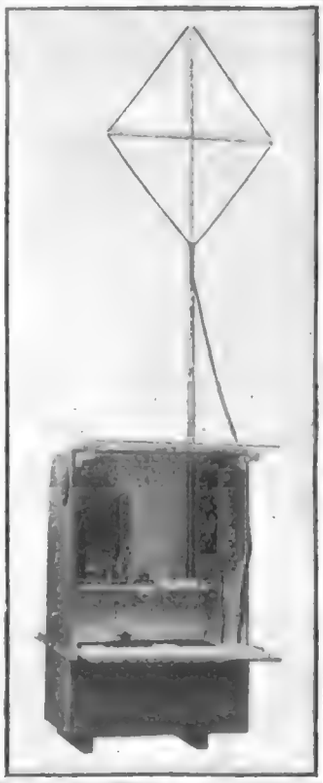
New Equipment for Life Boats.





RADIO has become so much a part of the life of the United States that a few weeks ago there was held at Grand Central Palace, New York, the American Radio Exposition, showing every kind of equipment and the latest advances made in the craft. It promises to be a yearly affair. Above is shown one of the most interesting pieces of apparatus exhibited at the show. It is the new English invasion of the American loud-speaker market, the Amphion. Going back to the old principle of the long air column and equipping it with a very hardy diaphragm the horn produces voice and music with surprisingly little distortion and the device is capable of taking a very strong current.

The young lady shown below is taking the boredom out of gray squirrel hunting by carrying her radio set on her Nimrodian adventures. The gray squirrel is most easily seen just at dawn and dusk and the wait for him to put in his appearance sometimes becomes tedious. With the simple aid of a small dry battery set and a loop antenna the Maryland girl in the photograph is whiling away the last half hour before her quarry comes to play. She was one of a large hunting party that took the set with them into the woods so as to while away spare moments.



THE World's Series was a serious time for this youngster (above) for he lived a long way from the village score board and the wood pile needed attention. But he took the disaster out of his position by moving the radio set from upstairs so that the two great events—the Series and the wood pile both were attended to.

By installing small one-quarter kilowatt radio sets (left)—and a small gasoline motor with alternator to furnish power—aboard life boats, an English chandlery firm hopes to reduce the loss of life caused by the loss of open life boats in heavy storms. The aerial is directional.

In the Amateur Built radio set contest at the recent Radio Show in New York, one of the most popular entries was the set of Miss G. Alexander, whose set (below) was built as a replica of Eiffel Tower. All the apparatus is concealed within the tower with the exception of the honeycomb coils.

Digitized by Google

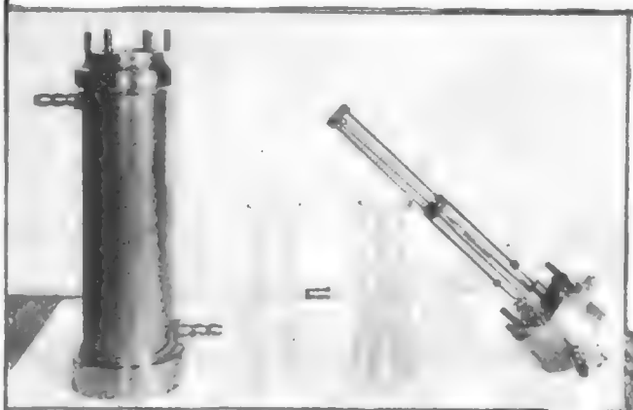
Original from UNIVERSITY OF CHICAGO

Last Minute Radio News

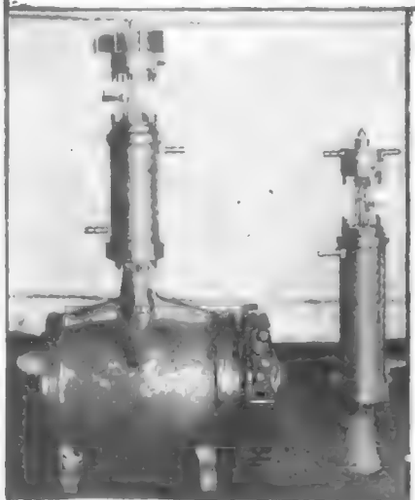
Novel Designs; New French Power Tube.

ANOTHER exhibit that created a great deal of attention at the Radio Show was a set in a plate glass cabinet. It is shown above. The loud speaker accompanying it is also of noteworthy design. Below is a step forward in the manufacture of power tubes brought out by a Paris scientist and put into use in the famous Eiffel Tower station. It is built up of a number of parts and can be instantly taken apart for repair. With the constant increase in the price of the larger power tubes it has become necessary to repair old tubes.

One of the most noteworthy features in examining the apparatus shown at the Radio Show was the tendency of the manufacturers to work their sets into some form in which they could be put into the well furnished home, without impairing the aspect of the rooms in which they are placed. The careful householder demands that the furnishings of his home be ornamental as well as useful. Above is one of the radical departures in cabinet design. The set, designed primarily for the use of the broadcast listener is housed in a lamp-like case. It consists of three stages of radio and two of audio amplification. The loop aerial appears at the side of the cabinet. Batteries are in case below.



Above is a view of the demountable tube with the fixed elements on the cap and the glass case. The metal cylinder is air-tight and acts as the water-cooling shield. It is also the plate element.



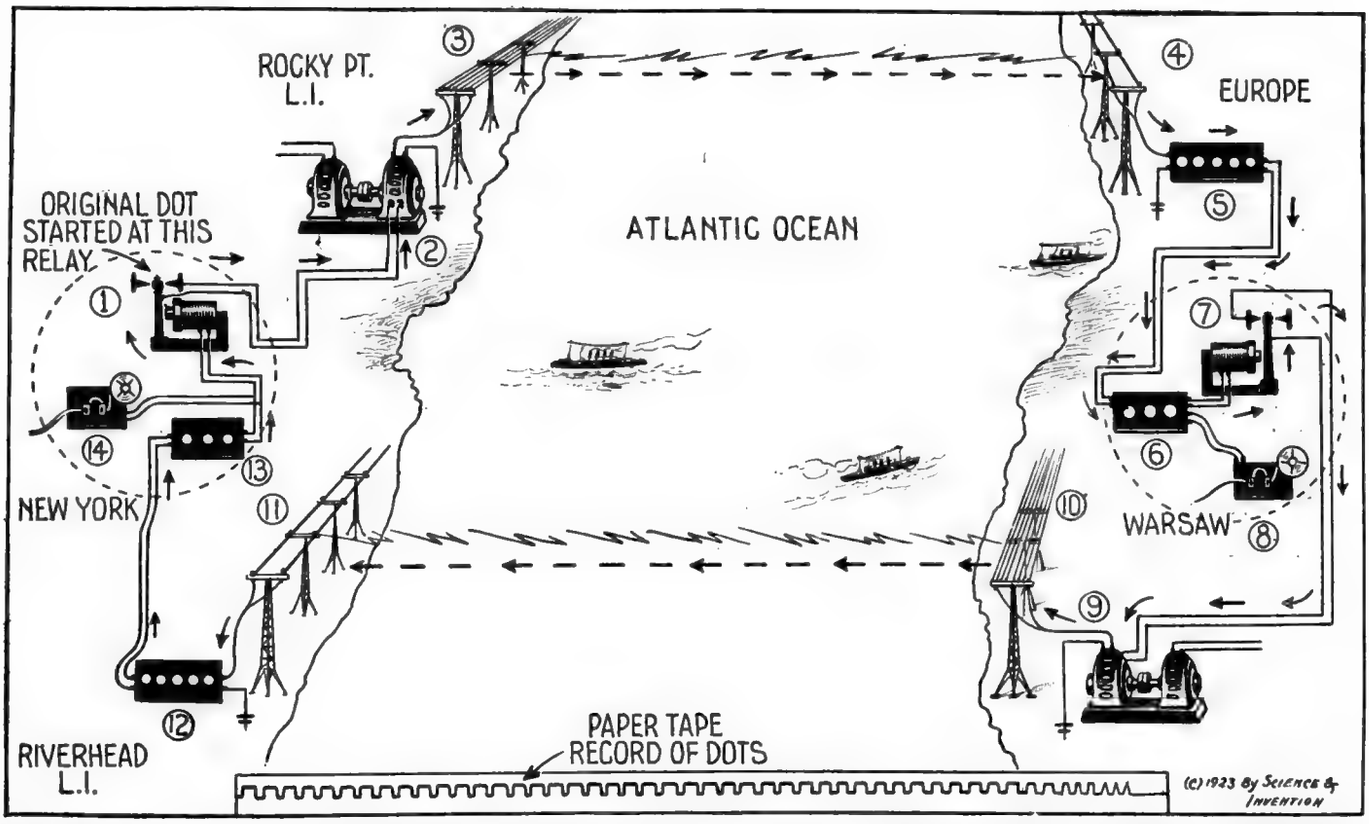
The tube is always connected to a mercury vacuum [illegible] above) It runs continually while the [illegible]on. After a repair is made [illegible]ted in fifteen minutes.

Distance fiends (or DX hounds, as they are called in the parlance), please note. Above is the new and enlarged transmitter of the amateur station 2CTQ, known to many amateurs throughout the country. Mr. Leo Johnson, owner of the station, is shown sitting at the microphone of his new outfit. The improvement in the transmitter is the installation of a new 20-watt C.W. outfit using four five-watt tubes. Many amateurs outside of the first, second and third districts (the East Coast) will now be able to hear 2CTQ, although he already has an enviable record for long distance work and has taken part actively in the work of the Amateur Radio Relay League. Note the accessible arrangement of the instruments.

Digitized by Google

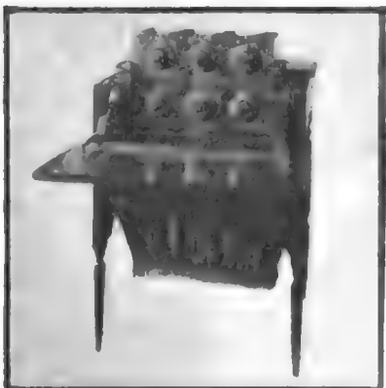
Original from UNIVERSITY OF CHICAGO

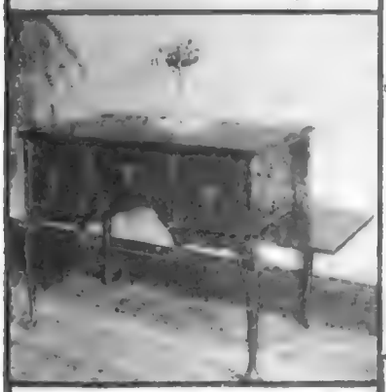
Radio Makes Transoceanic Circle



Recent experiments started a radio dot from the United States sent it to Europe and return many times, covering an actual distance of 4,500,000 miles, without the assistance of an operator. The signal originated in New York City on relay 1. It traveled to 2 and 3 and then across the ocean to 4, through instruments 5 and 6 and actuated relay 7. It was recorded on 8. Then it went thrcugh 9 and 10, came back to the United States to 11, through 12 to 13 and then actuated relay 1, starting itself all over again. At the foot of the diagram is the tape record of dots showing how they varied in duration because of the mechanical lag of the relays, becoming shorter until they died out.

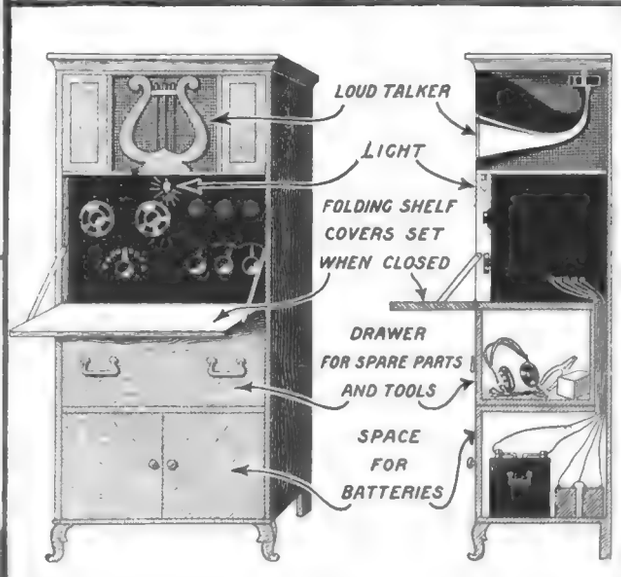
Latest Designs In Radio Cabinets





Above is a combined side table and radio set. As will be noted the right end drops down exposing a complete receiving set. The loud talker is also included in this cabinet.

The radio set illustrated at the left could well grace any living room. By lifting up the front shelf, the set sinks down out of sight and the cabinet folds up and makes a very nice decorative table. Right: A hand carved antique model cabinet which houses an up-to-date radio set with power amplifier and loud speaker. It is entirely self-contained.



In the above illustration is shown a suggestion for amateur constructors who desire to put their radio set into the best possible form. The loud-talker is located directly above the set, which latter is covered by cloth. A drawer is provided for tools and spare parts and at the bottom is a space for the storage "A" battery and the "B" batteries.

Above: A sturdy, serviceable model of a radio receiving set cabinet. A novel system of dial control is used in which the figures may be seen through slots in the front of the cabinet.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Radio Transmission of Photographs

A Recently Developed and Simplified, Yet Accurate Method of Transmission.

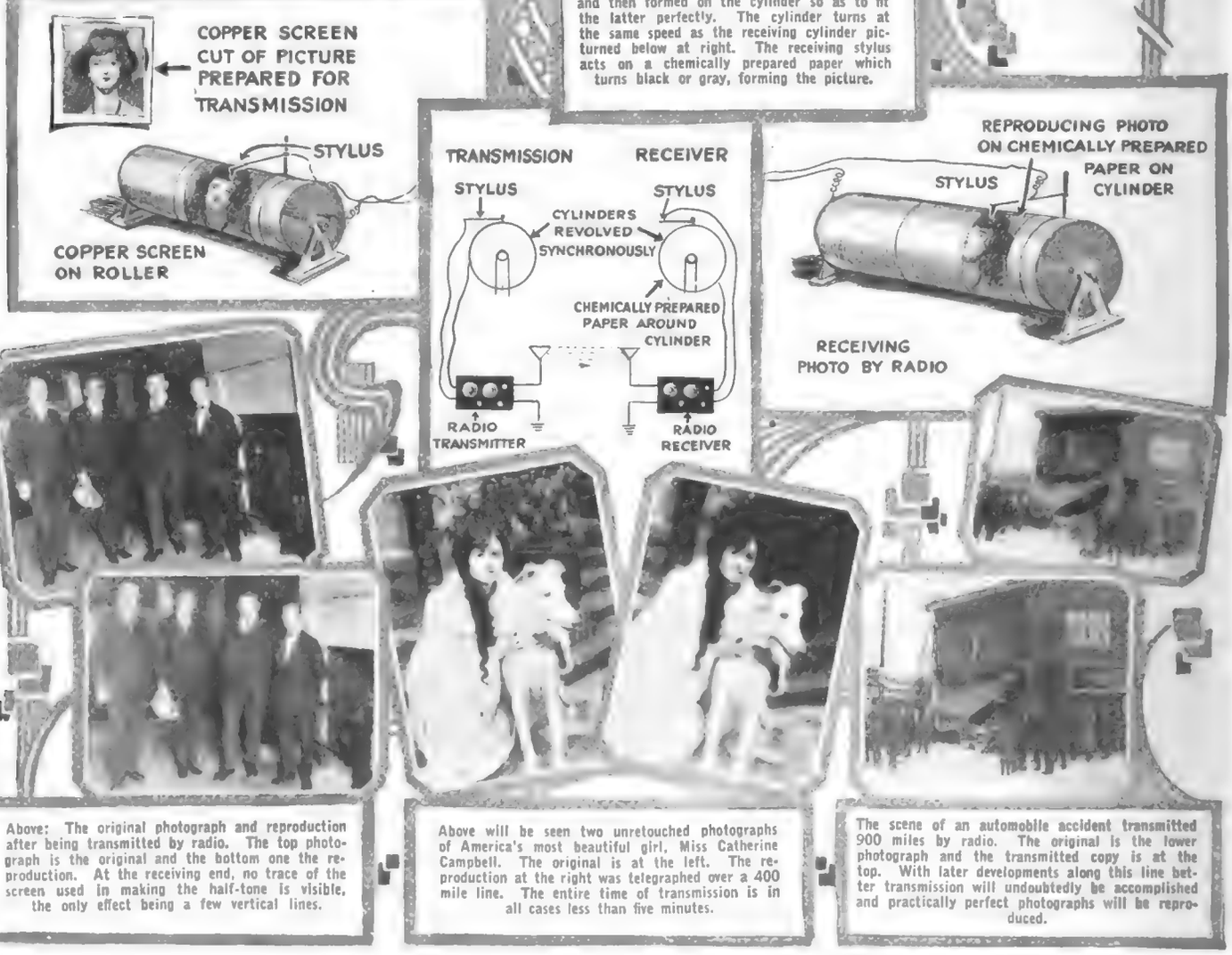
BY A. P. PECK

Below and to the right will be seen the transmitting apparatus used for sending photographs by radio. As will be noted, the apparatus takes up little more space than the average receiving set. A cylinder is rotated by means of an electric phonograph motor, a governor being used to maintain a constant predetermined speed. The photograph, made into a half tone on copper or zinc with a one-line screen is placed on the cylinder with a stylus in contact with it. The stylus moves in a spiral course at a rate of 175 turns to the inch. The stylus, working over the indented surface of the half-tone causes fluctuations in the current.

Above: The receiving apparatus used by Mr. Ferree in the reproduction of photographs transmitted by radio. At the right in the above photograph is a standard radio receiving set and at the left will be seen the apparatus for reproducing the transmitted photograph. Mr. Ferree has perfected his apparatus to a very great extent and claims that it will be extremely useful in newspaper work for transmitting photographs of current events. With this apparatus, it is possible to carry on communication over the same lines on which the photograph is being transmitted, both transmissions taking place simultaneously.

Above: The inventor of the system of radio and wire transmission of photographs, Marvin Ferree.

Below at left: A diagram of the transmitting cylinder and stylus contact. The half-tone is prepared on either a copper or zinc plate and then formed on the cylinder so as to fit the latter perfectly. The cylinder turns at the same speed as the receiving cylinder picturned below at right. The receiving stylus acts on a chemically prepared paper which turns black or gray, forming the picture.



Above: The original photograph and reproduction after being transmitted by radio. The top photograph is the original and the bottom one the reproduction. At the receiving end, no trace of the screen used in making the half-tone is visible, the only effect being a few vertical lines.

Above will be seen two unretouched photographs of America's most beautiful girl, Miss Catherine Campbell. The original is at the left. The reproduction at the right was telegraphed over a 400 mile line. The entire time of transmission is in all cases less than five minutes.

The scene of an automobile accident transmitted 900 miles by radio. The original is the lower photograph and the transmitted copy is at the top. With later developments along this line better transmission will undoubtedly be accomplished and practically perfect photographs will be reproduced.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

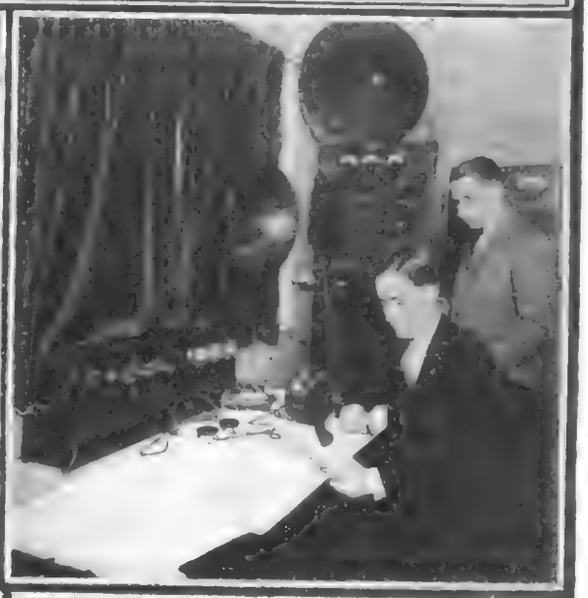
The Biography of a Vacuum Tube

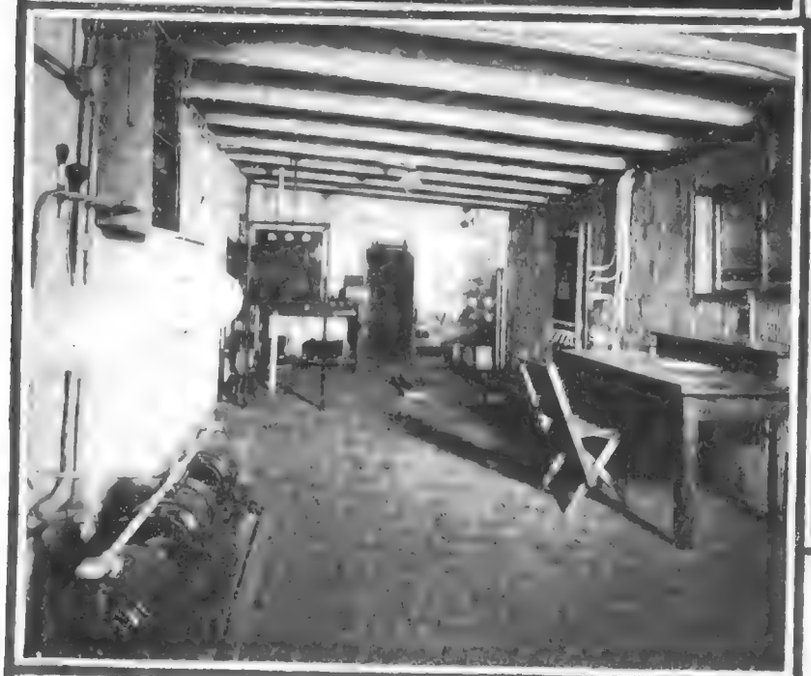
A Pictorial Review of the Manufacture of a Dry Cell Vacuum Tube.

1
Above: A blown glass globe as it is received by the manufacturers of the vacuum tube, from the glass blowers. This bulb goes first to the machine shown at the right where it is cut to size and sealed to a smaller tube.
B
A
C
2
Above: The machine which performs two operations on the glass bulb. At C, a hot flame is directed on the top and a hole blown therein. At A, a glass tube from hopper B is sealed to the opening thus formed. This tube is to be used in a later step for evacuation.
3
Left: The embryonic vacuum tube when it leaves the machine illustrated at 2. The narrow glass tube is now an integral part of the bulb, and the unit is ready to receive the elements.
4
Left: The form on which the elements—the grid, plate and filament— are placed. Note that five wires extend above the glass tip while only four go below. The odd wire supports the grid.
5
Above at right: The elements of the tube firmly mounted on the five projecting wires. The lower wires are soldered to the prongs on the base of the tube.
A
B
6
The above illustration shows a small foot-fed arc, the electrodes indicated by A. This arc is used to weld the filaments into vacuum tubes. The elements are indicated by B. It is impossible to use solder in this place.
7
The glass tube as shown at 3 and the elements as at 5 are now sent to the machine illustrated above and welded together. A is the long thin tube and B the glass bulb.
8
Above: The appearance of the bulb and glass tube with the elements sealed in.
D
C
A
B
9
A indicates the vacuum tube. B shows the connection between the tube and the exhaust pump. C shows a coil for exhaustion by heating and D an electric furnace for baking to assist in exhaustion.
10
The bases are now sealed on the tubes and the connections made to the prongs. The young lady in the above illustration is testing the connections. At this stage many tubes are rejected because of defects in the filament.
11
Above is shown the testing table where bulbs are tested for plate and filament consumption. After being burned for an hour on this table, the bulbs are set aside to age and are tested again, whereupon, if they come up to the standard, they are packed for shipment.
12
Above: The finished vacuum tube as it appears when ready for the consumer, carefully tested and ready for service.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

BROADCAST—STATIONS

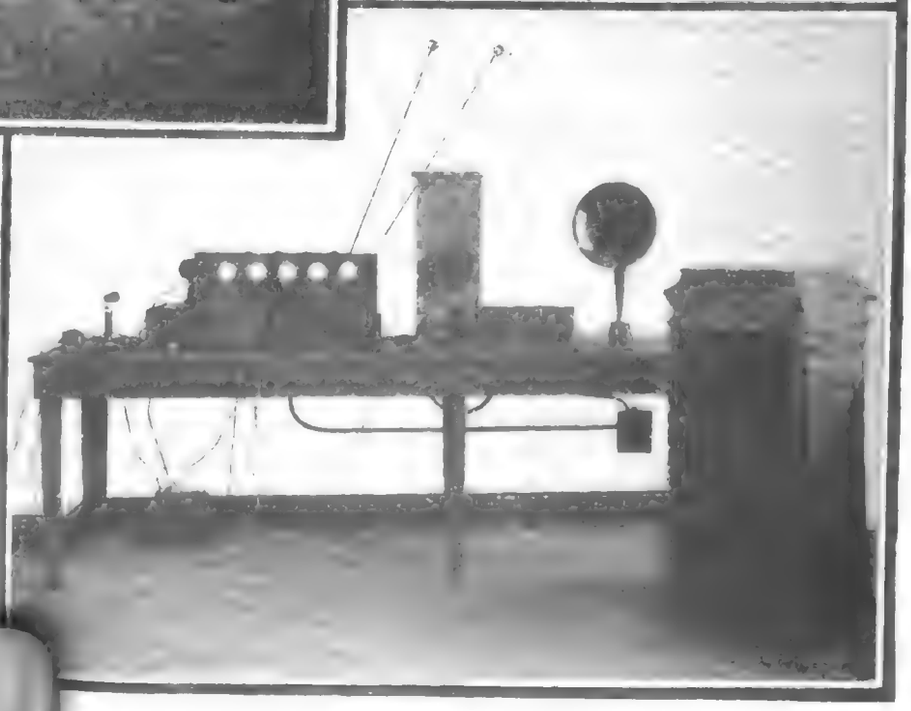




THE two photos directly above show the interior of the operating room and the studio of station WSY, Birmingham, Ala. The studio follows the regular lines of construction with the exception that the main microphone leading to the modulators is suspended with elastic from the ceiling of the studio. There is a special small microphone that is used to pick up the piano and the Victrola when they are used in connection with programs. The operating room seen in the lower of the two photos shows the neatness and the skill that has been used in assembling the station. All controls for the set as well as the motor-generators are gathered together in order to make for ideal operating conditions.

The top photo at the right shows the operating end of station WOS, the State Marketing Bureau of Missouri, located at the capitol of the state, Jefferson City. Sitting in the photo is J. M. Wittem, announcer and program director. Standing, is R. J. Engler, the engineer in charge of the operation of the station. Although the broadcasting of the station has principally to do with the announcing of prices on farm products and general market conditions, programs are broadcast under much the same schedule as obtains in other Middle-Western stations.

At the bottom of the page may be seen the Peoria Star Company's station (WJAN) located at Peoria, Ill. The photo shows the interior of the operating station and the talking machine with microphone attached which is used in some of the programs. Note the neat arrangement of the apparatus.

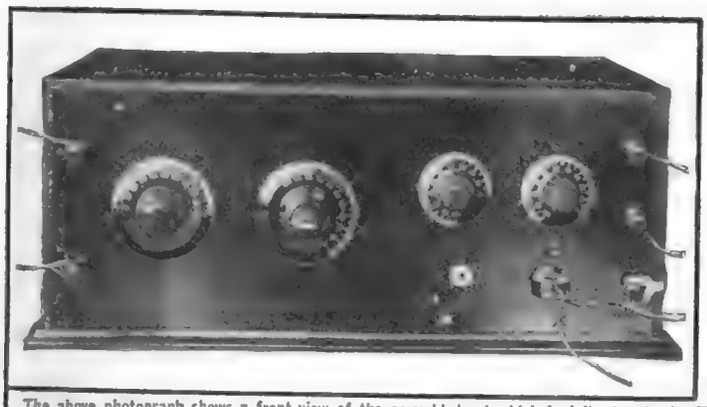


Digitized by Google
Original from UNIVERSITY OF CHICAGO

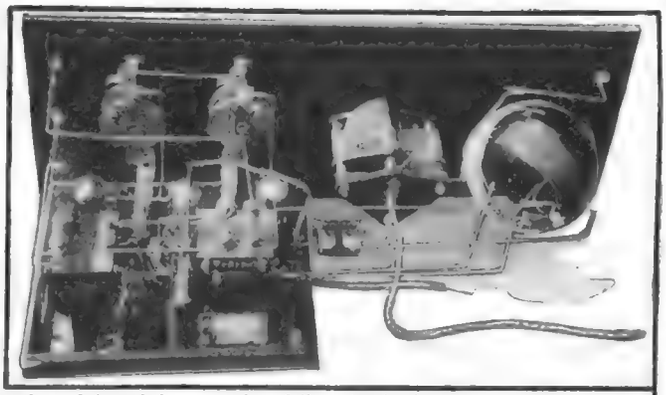
An Untuned Primary Receiver

A Two Control Set With Extreme Selectivity

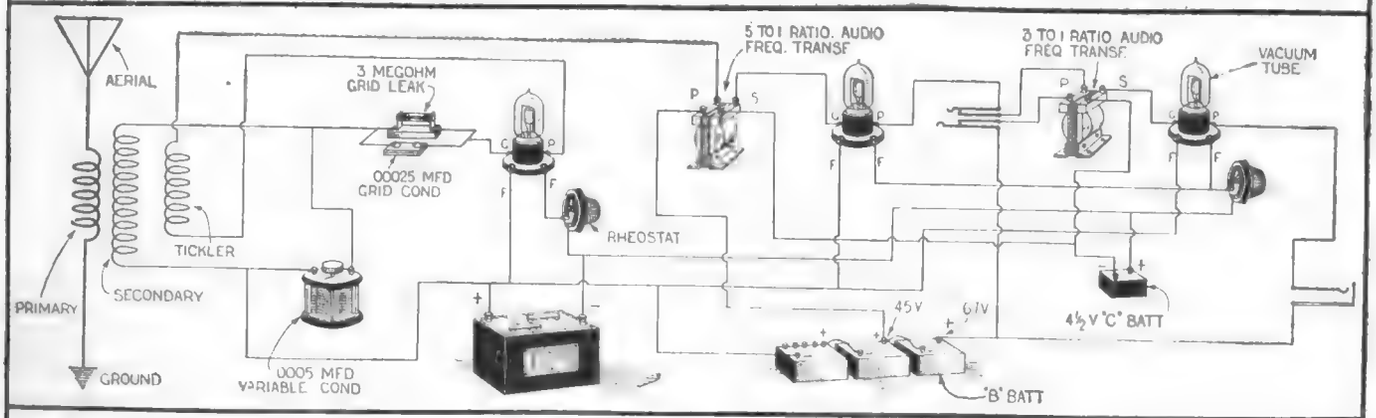
BY W. L. PEARCE.



The above photograph shows a front view of the assembled set which is fully described and illustrated below. There is one tuning control, the second dial from the left. The first dial on the left controls regeneration. Only two rheostats are used, one for the detector and the other for controlling both amplifier tubes.

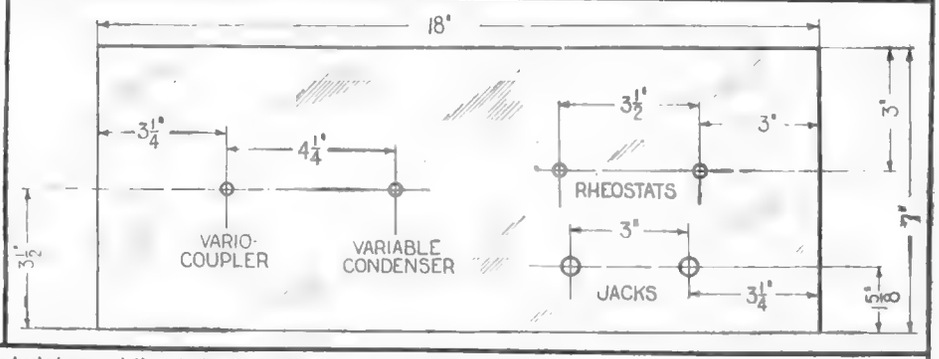


The above photograph is a rear view of the untuned primary receiving set, taken at a slight top angle. Notice the relative positions of the two audio frequency transformers and how the cores are turned at right angles to each other so as to avoid inter-action. The three tubes are placed just behind the two transformers.

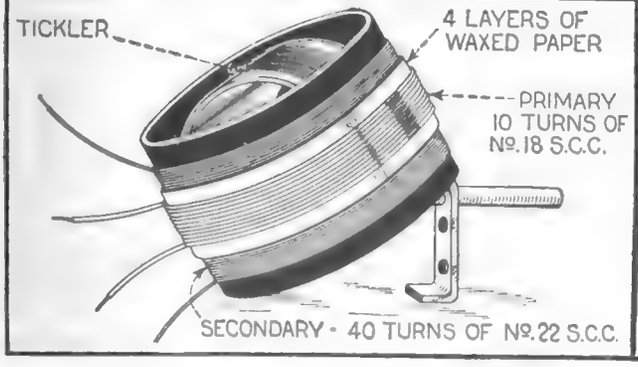


The above circuit diagram shows all the connections for this very selective yet simply tuned radio receiving set. The primary is "aperiodic," or so designed that it will respond to practically all wave-lengths over a certain band. The secondary is then sharply tuned to the incoming signal. It has been found in tuning this set that three degrees on either side of a certain point on the condenser scale will tune out a station. This allows quite good selectivity. Note that a single rheostat and 4½ volt "C" battery are used on the amplifier tubes. With U. V.-199s, or C-299s, the "C" battery is very necessary in order to cut down tube noises.

At the right is given the panel lay-out for the set, photographs of which are shown above. The extreme simplicity of the panel should appeal to everyone; only six holes aside from those for the binding posts being necessary. The posts for connections can be mounted either on the ends of the panel as illustrated in the above photographs or on the cabinet as desired. If the latter method is used, it will be found that it will do away with unsightly wires on the front of the set. The two jacks take care of the phone connections and are so placed that either the first or second stage of audio frequency amplification may be used as desired. Rheostats with a resistance of 30 ohms should be used in this circuit if vacuum tubes drawing only .06 ampere are used.



Sometimes when a set of the type described herewith is hooked up, and the set placed in operation, a loud noise like the sounding of a deep toned bell will be heard when the set is tapped or even touched. This is due to the vibration of the elements of the tubes and can usually be eliminated by trying different tubes in different positions. It is sometimes found that by placing an amplifier tube in the detector socket and the detector tube in place of the amplifier, this difficulty will be remedied. Mount sockets on felt. The above applies to the dry cell tubes, which have very small elements, and which are recommended for use in this set.



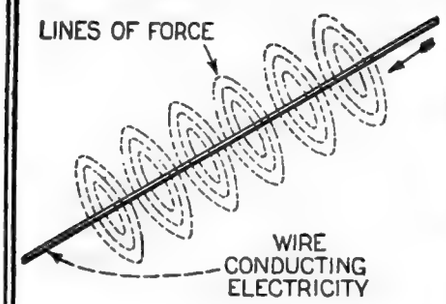
At the left are shown all the constructional details of the variocoupler used in connection with this very selective receiving set. It is of the 180 degree type and any well made instrument will answer. The primary winding must be removed and 40 turns of No. 22 S. C. C. wire wound on the stator. This acts as the secondary of the tuner. In most cases the rotor, which is to be used as the tickler coil, need not be changed. Directly over the secondary winding, place four layers of waxed paper or oiled linen. Over this wind 10 turns of No. 18 S. C. C. wire, fastening the ends of the winding with sealing wax. It is quite essential that large wire be used on this latter winding so that the distributed capacity will be kept down as much as possible and so that the tuning of the set will be sharper. In connecting the set, the movable plates of the variable condenser are connected to the filament side of the secondary. This method of connecting eliminates capacity effects when tuning. It is sometimes advantageous to ground the metal frame of the variocoupler for the same reason. When the rotor is horizontal, the plate lead should be taken from the bottom of the coil wound on the rotor, and the grid lead should be taken from the top end of the secondary. If care is taken to keep this connection correct, it will not be found necessary to reverse the leads to the tickler coil as usually must be done when first hooking up a circuit using feedback regeneration.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

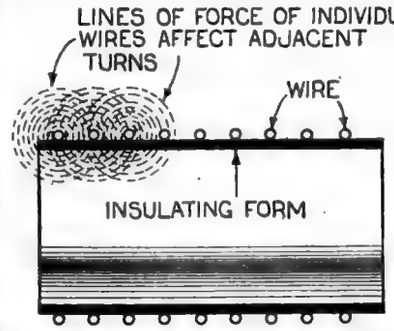
Radio for the Beginner

By ARMSTRONG PERRY

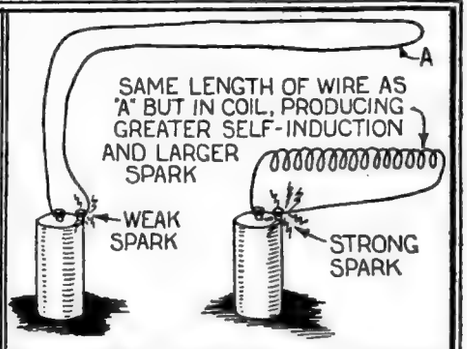
No. 23—INDUCTION.



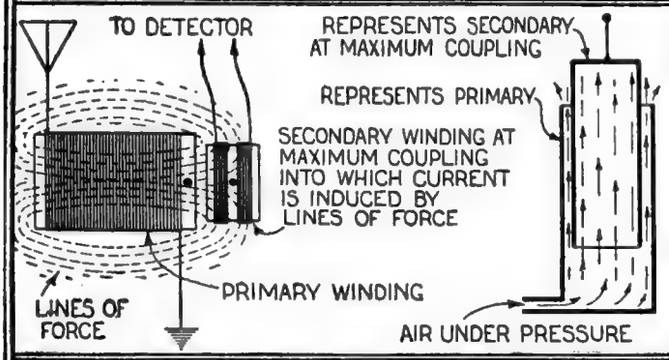
Upon the magnetic lines of force depend induction. These lines of force if visible would take the form of circles surrounding the wire as an axis.



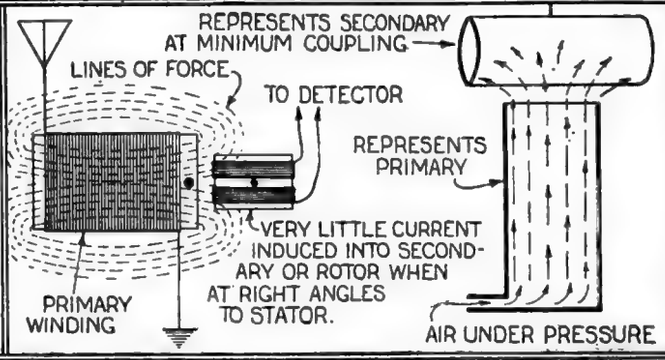
When wire is wound in a coil form, the lines of force intersect adjacent wires as shown above and induce currents into each other. This is self-induction.



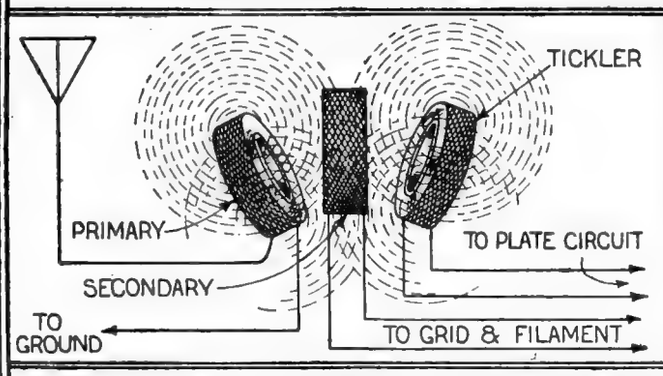
The difference between the two sparks produced as illustrated above is caused by the lines of force from the turns in the coil acting on the next.


TO DETECTOR
REPRESENTS SECONDARY AT MAXIMUM COUPLING
REPRESENTS PRIMARY
SECONDARY WINDING AT MAXIMUM COUPLING INTO WHICH CURRENT IS INDUCED BY LINES OF FORCE
PRIMARY WINDING
LINES OF FORCE
AIR UNDER PRESSURE

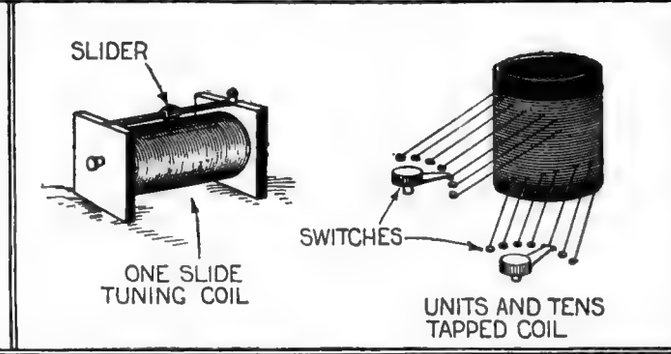
In practical radio work, induction is made use of in the variocoupler. The lines of force having the property of inducing a current into conductors which they intersect make a transference of energy from the stator or primary to the secondary or rotor. An analogy is shown for this at the right.


REPRESENTS SECONDARY AT MINIMUM COUPLING
LINES OF FORCE
TO DETECTOR
REPRESENTS PRIMARY
VERY LITTLE CURRENT INDUCED INTO SECONDARY OR ROTOR WHEN AT RIGHT ANGLES TO STATOR.
PRIMARY WINDING
AIR UNDER PRESSURE

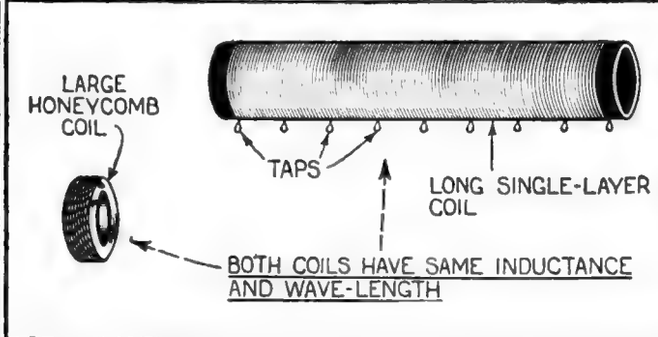
In the above illustration the rotor is shown at right angles to the stator of a variocoupler and the amount of current in the secondary circuit is very small. In the analogy at the right the piston is removed from the cylinder and suspended above it at right angles. The current of air striking the curved surface exerts little pressure.



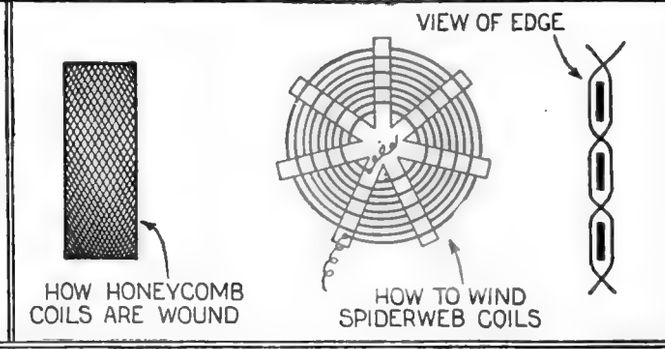
The current in the primary honeycomb coil sets up lines of forces. These emanate from the coil, cutting the secondary coil and inducing a current therein. The tickler coil sends out its own lines of force which again effect the secondary and set up what is known as regeneration.



Two methods of varying inductance are shown above. A slider moves over a path of bare wire and makes contact thereto. At the right taps are taken off at various sections along the coil of wire and connected to switch points. Arms make contact with the switch points.



Large inductance coils used to be necessary to receive long wave stations, which then did most of the transmission. Today their form has changed considerably. The long coil illustrated above is the old form and at the left is shown a honeycomb coil of the same inductance, but only an inch or so thick.

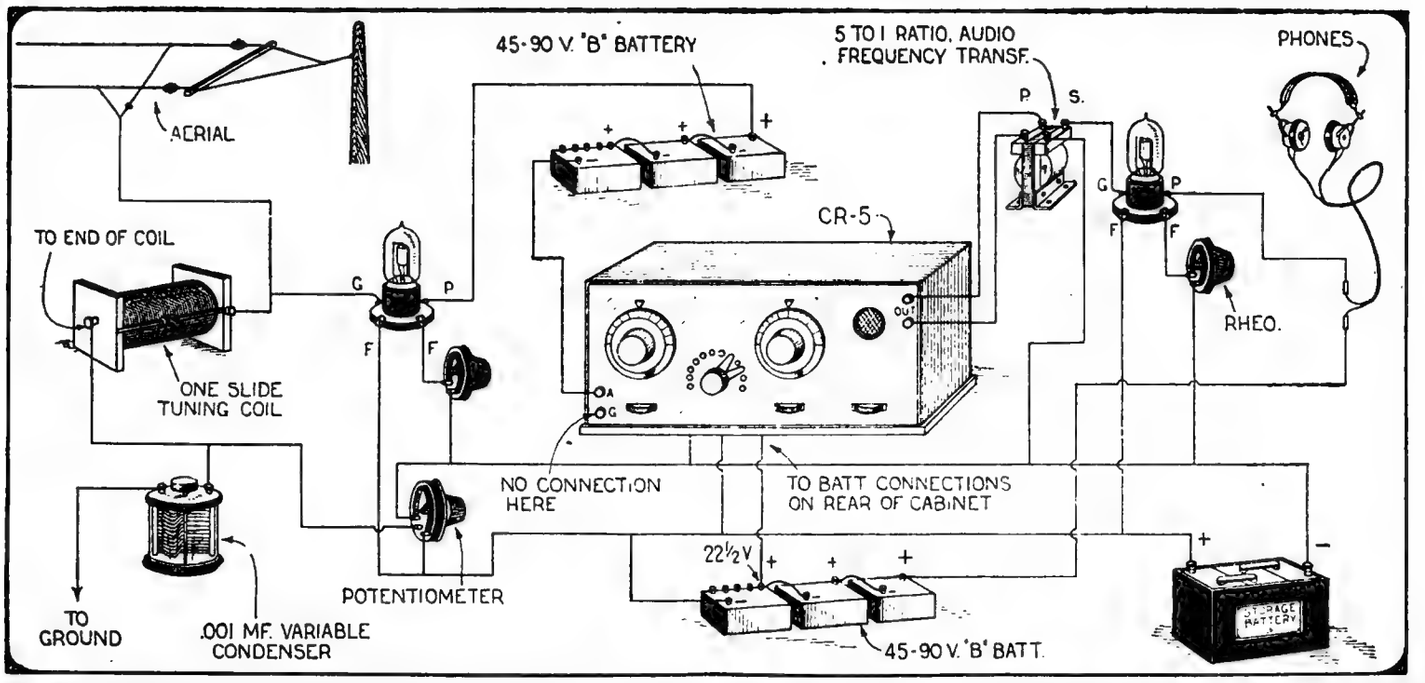


Both honeycomb and spider-web coils are very efficient. The distributed capacity of the coils is low, an advantage in radio work, and the inductance is high. A great amount of the latter can be obtained in a small space. At the right is shown a flat view and an edge view of a spider-web coil.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Radio Oracle

In this Department we publish questions and answers which we feel are of interest to the novice and amateur. Letters addressed to this Department cannot be answered free. A charge of 25c is made for all questions where a personal answer is desired.



No. 208. To increase the receiving radius of a standard signal circuit tuner of practically any type, radio frequency amplification may be added by following the circuit diagram given above. The remarks relative to the series antenna condenser which are given in the text should be carefully noted, as inattention to points given there will result in the set's failure to operate. If desired, a honeycomb coil may be substituted for the one slide tuner indicated in the diagram. Various coils will have to be substituted to cover the band of wave-lengths desired. The inductance used in the antenna circuit should be such that its wave-length will tune in the incoming signals.

R. F. AND A. F. WITH STANDARD RECEIVER

(208) George Siedel, Pittsburgh, Pa., writes to the Radio Oracle:

Q. 1. How can I connect one stage of radio frequency amplification with my type CR-5 receiver and place after the same one stage of audio frequency amplification?

A. 1. The diagram given in these columns shows all the necessary connections. It is imperative that the variable condenser which is connected in series with the antenna binding post on your set be short circuited or else removed from the circuit so that the aerial binding post will be connected to the grid end of the stator. If this is not done, the set will not function. It is advisable to connect this variable condenser in parallel with the stator so as to give sharper tuning although in some cases it will be found that such a procedure will raise the wave-length to a point where broadcasting stations cannot be received. Thereupon the condenser should be removed from the circuit.

STORAGE "B" BATTERY QUERY

(209) Joseph Karl, Pittsburgh, Pa., asks:

Q. 1. In making a storage "B" battery should the plates be pasted in the same manner as those in a large storage battery such as used in automobiles?

A. 1. Yes.

Q. 2. What kind of wood should be used for separators?

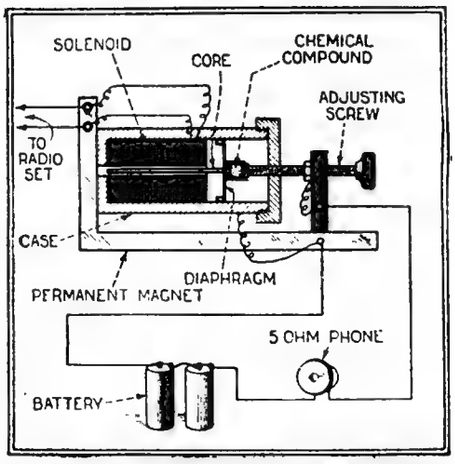
A. 2. Practically any kind of wood could be used, but white pine or spruce is best. Even better than wood are perforated sheets of thin hard rubber.

MULTI-AUDI-PHONE

(210) James McCarthy, Bayonne, N. J., asks:

Q. 1. Is the apparatus known as the multi-audi-phone still on the market?

A. 1. To the best of our knowledge this apparatus is no longer manufactured.



One of the first successful types of microphone amplifiers is shown above. This is the cross section view so that the solenoid and the location of the compound may be readily seen.—No. 210.

Q. 2. What is the principle of the multi-audi-phone and how is it constructed?

A. 2. You will find in these columns a cross sectional diagram of the microphonic amplifier known as the multi-audi-phone. As will be seen, it consists of a solenoid within which is a movable core, which in turn is connected to a diaphragm. On the opposite side of the diaphragm is a projection, the end of which is cup shaped. Close to this is another cup shaped projection which can be moved closer to and further away from the former by means of a screw. Between these two surfaces and held in place by an insulating tube is found a compound which we believe is carbon in a granular form. The action of this instrument is similar to that of the microphone and becomes obvious upon studying the accompanying diagram.

A. F. AMPLIFICATION WITH A REINARTZ TUNER

(211) T. L. Jacoby, Detroit, Mich., wants to know:

Q. 1. Can I add four stages of audio frequency amplification to a Reinartz tuner?

A. 1. We would not advise you to use four stages of audio frequency amplification on a Reinartz or any other type of tuner. Furthermore, if you desire to use amplification with this circuit, it may be added in the standard way, no change being necessary for this particular type of set. Two, or at the most only three, stages of A. F. amplification should be used.

RADIOPHONE TRANSMITTER TUBE

(212) Gilbert Joyce, Kansas City, Mo., asks:

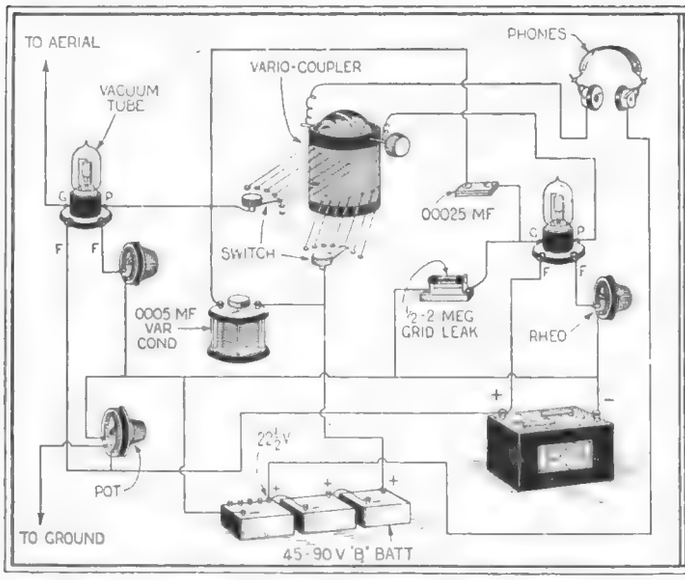
Q. 1. Can a U.V.201 vacuum tube be used as a radiophone transmitter?

A. 1. A U.V.201 vacuum tube with 100 to 150 volts on the plates will act as a transmitter over very short distances. Any one of the 5-watt tubes will give good results.

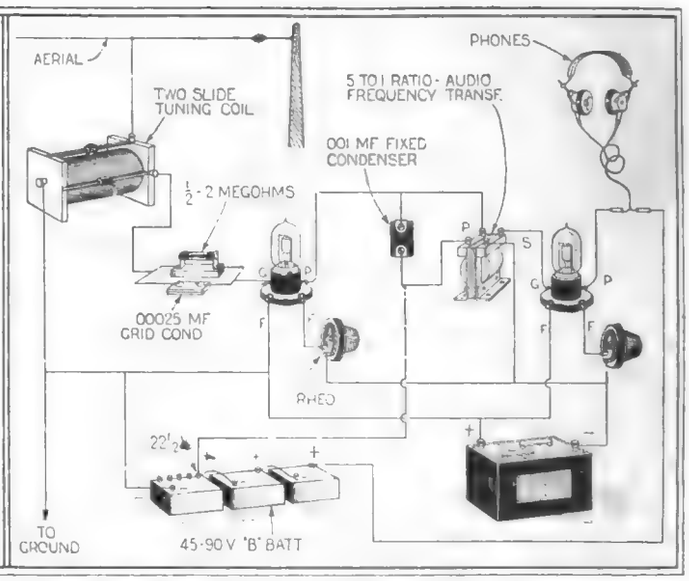
WANTED!!! RADIO ARTICLES

WE want descriptions of new radio ideas which you have worked out in practice. Take photographs of the important parts and make pencil or pen and ink sketches of the hook-ups or mechanical details, et cetera. We are particularly desirous of obtaining new hook-ups and descriptions of single tube sets, reflex and other types which have proven satisfactory. We want articles on the latest single tube receptors which require a minimum current from the filament battery.—Editor.

Digitized by Google
Original from UNIVERSITY OF CHICAGO



In some cases it is possible to use radio frequency amplification without any tuning arrangement between the R. F. amplifier tube and the antenna. Such a circuit diagram is shown above. At times it will be necessary, however, to place a one slide tuning coil in series with the antenna.—No. 213.



In districts where there is not much radio congestion and very little interference from nearby broadcasting stations, louder signals will be obtained by using a two slide tuning coil as shown in the above diagram instead of more complicated and expensive apparatus. For broadcasting the wave-lengths a small coil may be used.—No. 216.

UNTUNED ANTENNA CIRCUIT

(213) Charles Burg, Riverside, Cal., asks:

Q. 1. How can I place one stage of radio frequency amplification in front of my single circuit tuner without an apparatus for tuning the antenna circuit?

A. 1. The diagram in these columns shows all the necessary connections for such a circuit. It is advisable to place the grid leak in the position shown rather than in the conventional place in parallel with the grid condenser. An amplifying tube is used at the extreme left and a detector tube in the other socket. The potentiometer may or may not be used as is found best by experiment.

SQUEALING

(214) Elmer Kayler, Dayton, Ohio, says that his set howls and squeals continuously when his hand is brought near any of the controls. He asks:

Q. 1. How can I eliminate this and will a vernier condenser be of any assistance?

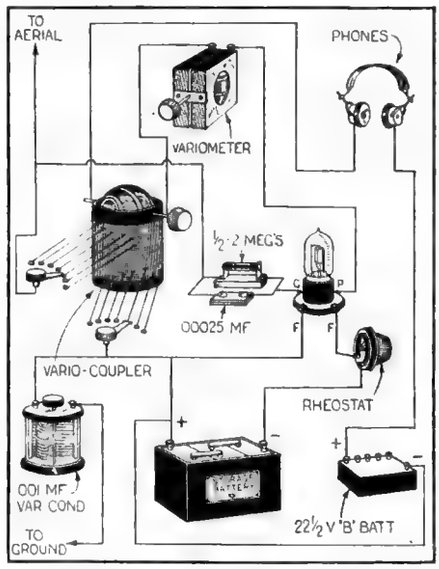
A. 1. You can probably eliminate the trouble you mention by shielding the back of your panel with aluminum and grounding the shield. The trouble is due to the capacity of your body and can be eliminated as mentioned above. If this work is done a vernier condenser shunted across your antenna condenser will be of assistance in accurate tuning.

VARIOMETER WITH SINGLE CIRCUIT TUNER

(215) Robert Fitch, Lakewood, Ohio, asks:

Q. 1. How can a variometer be added to my present standard type of single circuit tuner?

A. 1. The circuit diagram herewith shows how a variometer may be connected in series with the plate of a standard single circuit tuner. Recent experiments have shown that such an addition to a standard single circuit set makes it more selective under almost all conditions.



If a variometer is placed in series with the plate of a vacuum tube in a standard single circuit tuner, much greater selectivity will result as a combination of the feed-back and tuned plate system.—No. 215.

TWO SLIDE TUNER WITH DETECTOR AND AMPLIFIER

(216) C. Saracool, New Hudson, Mich., requests:

Q. 1. Can you show me how to connect a two slide tuner with a vacuum tube detector and one stage of audio frequency amplification?

A. 1. The diagram will be found in these columns.

AMPLIFIER TROUBLE

(217) Frank Prell, Osceola, Nebraska, sends diagram of his detector and two-stage amplifier and says that he has placed his transformers quite a distance apart, but that he still gets whistling noises during reception. He asks:

Q. 1. Can you tell me what is the trouble with my circuit?

A. 1. The whistling noise is probably caused by the way you placed your transformers in an endeavor to cut it down. The long leads necessary between your transformers have a capacity effect on the circuit, thereby causing the howling. In connecting up your set, do not have the grid and plate circuits cross each other. Also try reversing the leads on the transformers, grounding the filament, and shielding all the apparatus.

Your circuit diagram is O. K., but would suggest that you connect the fixed phone condenser directly across the primary of the first amplifying transformer.

Variable grid leaks and condensers are always preferable in any type of set, and we would advise you to try various resistances and capacities until the correct value is obtained.

FIRST!

RADIO NEWS is the FIRST radio magazine in the world today. It is FIRST in circulation, printing over 250,000 copies a month. It is FIRST in advertising patronage, carrying a larger amount of advertising than any other Radio magazine in the world. It is FIRST in size, printing more matter than any other radio magazine. And last but not least, it is FIRST in quality. The greatest radio writers invariably write for RADIO NEWS first.

And before we forget it, RADIO NEWS prints radio news FIRST. Important news can always be found in RADIO NEWS ahead of all other publications.

SOME OF THE INTERESTING ARTICLES APPEARING IN JANUARY, 1924, ISSUE OF RADIO NEWS:

Pioneer Pathfinders of Radio,
By Jesse Marsten.

The Radio Police Car,
Armstrong Perry.

...s for Radio Beginners,
...Steinmetz.

Break-In Radio Relay Communication,
By Lieut. Col. J. D. Mauborgne.

A Balanced C.W. Circuit for Quick Wave-Length Changes,
By John L. Reinartz.

A Well Designed Short-Wave Receiver,
By James Wood, Jr.

Some Suggestions in the Design and Construction of Aerials,
By L. W. Hatry.

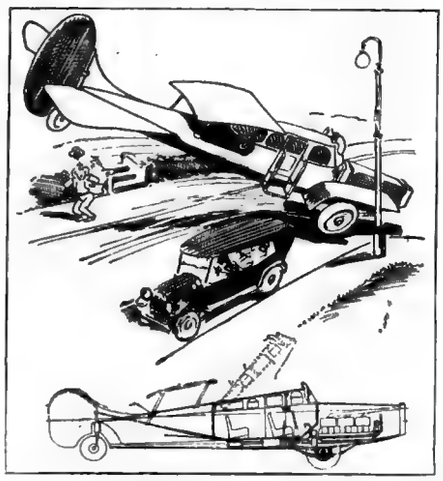
C.W. and Radiophone Transmitters—Part IV
By L. R. Felden,

A Practical Neutrodyne Receiver,
By Allan L. Hanscom.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

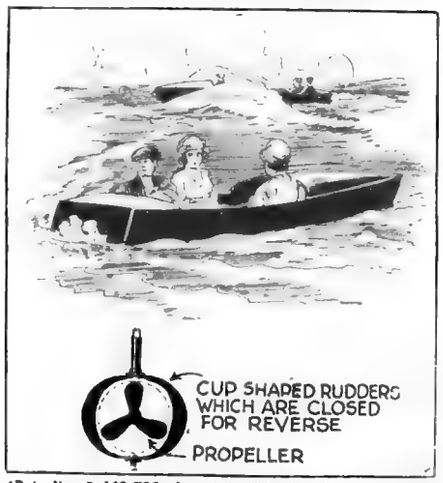
LATEST PATENTS

Auto-Airplane



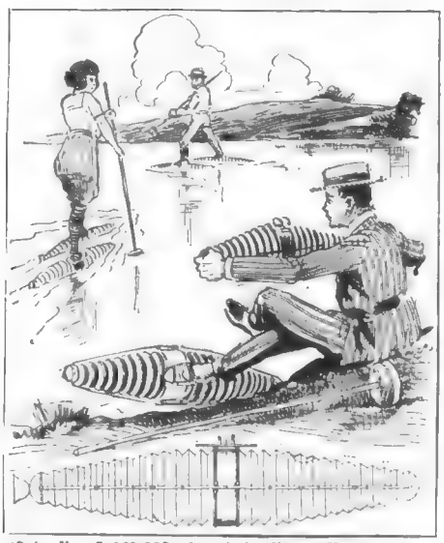
(Pat. No. 1,445,953, issued to Rudolph B. Illgen.) By equipping an automobile with wings and an air rudder as shown above, the bulk of the car's weight is removed from the wheels and very sharp turns are possible.

Reverse Rudder



(Pat. No. 1,449,803, issued to Johnston Robertson Alexander.) When the cup shaped rudders are closed behind the propeller the force of the water reacts against them and the boat goes backward. The rudders are also used for steering.

Water Shoes



(Pat. No. 1,463,330, issued to Henry Meyer.) Small pontoons made of a collapsible substance treated so as to be water-tight are furnished with foot rests. When not in use they may be folded on their steel frames so as to fit into a small box for transportation. The pontoons may be inflated and are provided with rudders for maintaining a straight course.

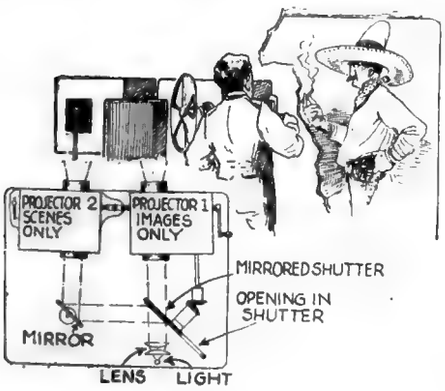
Shoe Salesman's Ventilated Stool

(Pat. No. 1,460,915, issued to Smith L. Luton.) To do away with the unpleasantness connected with the shoe salesman's profession, this invention places a fan under the foot rest of the salesman's stool. A current of air is forced over hot coils and against the perspiring foot. The hot coils and the fan are both electrically operated

Amphibious Toy

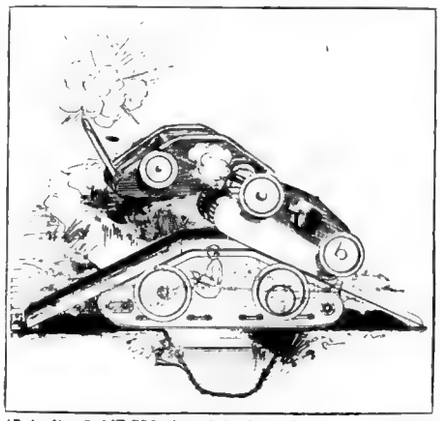
(Pat. No. 1,456,429, granted to Joseph L. Duggan.) The body of this toy is made of light metal. It is fitted with wheels, although it is built in the form of a boat. The spring motor it contains is connected to the wheels through a chain of gears and to an upright piece fastened to the figure in the boat holding the oars. When on land the boat is driven by the wheels; when it [illegible] the oars move it. Both the wheels and [illegible] tinuously. The figure holding the oars is attached to the seat in the boat pivoted.

Perspective Movies



(Pat. No. 1,461,133, issued to Thomas Henry Marten.) Two projectors, operated alternately, both using the same film, are claimed to produce movies in perspective.

Bridge Tank



(Pat. No. 1,447,893, issued to Irene Leroy.) This tank, constructed with collapsible ends, forms a bridge over large gulches for whippet tanks, as shown.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Scientific Humor

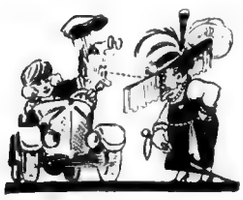
Maybe He Will Meter There.—The announcer at Broadcasting Station XYZ had had a hard day. Besides his duties as announcer, he operates a Radio Supply Store. He had many things on his mind.

He was reading the news bulletin: "John Doe, who was arrested here last month on a charge of robbing the mails, was today transferred to the Federal Potentiometer.—*Leslie J. Smith.*

While Hydrogen Tans Hide.—BOBBY: "Is oxygen what the oxen breathe all day?"

PAPA: "Of course, and what most everything else breathes."

BOBBY: "And is nitrogen what everyone breathes at night?"—*Edward Fleege.*



The Missing Link. — BILL: "Why the gloomy look, Joe?"

JOE: "I'm in trouble. My wife overheard me telling Steve Jackson that I had had two misses in my car the evening before."

BILL: "But that is no excuse for a row. Why everybody has engine trouble."

JOE: "But she found out that only one of them was in the engine."—*W. A. Loveridge.*

The Mechanics of It. —CRAWFORD: "There's an old fellow with a lot of jack."

CRABSHAW: "No wonder. He's a landlord and makes it jacking up rents."—*J. J. O'Connell.*

And We Must Pay $1.00 For These Jokes.—MR. BROWN: "What's the idea of these china dishes on my radio?"

MRS. BROWN: "You ought to be glad I put them there because you can tell Mr. Jones that you got China on your radio."—*Jessie Walters.*

A Delightful Joke. — Inventors are never taken seriously. No, even Edison made light of his theories. *Bradford Smith.*

And the Arch of the Foot Is Never Built.—WISE ONE: "It's funny that the pupil of the eye never learns anything."

WISE TWO: "Yes, and it's curious that the bridge of the nose is never crossed, and the roof of the mouth never repaired.—*J. Neuss.*

Nutley, N. J., Papers Please Copy.—BILL: "That new automobile manufactured by Jones and Company should prove quite popular."

TOM: "How so?"

BILL: "It requires only one nut."

TOM: "How wonderful! But why not eliminate all of them?"

BILL: "Well, you see, one must sit behind the steering wheel."—*Rev. D. C. Mac Leod.*

A Ringer.—"It asks no questions, but
[illegible] to answer it frequently."
[illegible] it?"
[illegible]"—*Julia Gross.*

First Prize $3.00

Most of Ours Is.—LUNATIC: "I've invented a coal that will last forever."

KEEPER: "How did you do it?"

LUNATIC: "I made it fireproof.—*Sidney Rochelson.*

Ought to Be Sold by Stationery Stores. No 1:. "They make engine wheels out of paper now."

No. 2: "That so? Use them for stationery engines I suppose."—*Everett Pardell.*

A New Tune.—WIFE (to husband operating new radio set): "Henry, what are you turning all them black wheels for?"

HUSBAND: "Why, it needs tuning."

WIFE: "Well that set can't be new if it needs tuning already."—*Karl L. Martin.*

WE receive daily from one to two hundred contributions to this department. Of these only one or two are available. We desire to publish only scientific humor and all contributions should be original if possible. Do not copy jokes from old books or other publications as they have little or no chance here. By scientific humor we mean only such jokes as contain something of a scientific nature. Note our prize winners. Write each joke on a separate sheet and sign your name and address to it. Write only on one side of sheet. No letters acknowledged unless postage is included.

All jokes published here are paid for at the rate of one dollar each, besides the first prize of three dollars for the best jokes submitted each month. In the event that two people send in the same joke so as to tie for the prize, then the sum of three dollars in cash will be paid to each one.

En-light-ened.—"Law is the oldest subject matter in the college," said the law student, "because Adam was evicted from Paradise for non-payment of rent."

"You are wrong," said the future doctor, "before that happened he was operated on."

"You are both wrong said the electrical engineer, "before all of that happened, the Lord pressed the button and said 'let there be light."—*Peter P. Udre.*

Seeing It Through.—PROFESSOR (to Soph.): "Explain the difference between transparent, translucent and opaque."

SOPH: "The windows in this building were once transparent. They are now translucent, and if they are not washed pretty soon, they will be opaque."—*Sadye Kauffman.*

Why, of Course.—"With all due deference my boy, I really think our English custom at the telephone is better than saying 'Hello!' as you do."

"What do you say in England?"

"We say: 'Are you there?' Then, of course, if you are not there, there is no use in going on with the conversation."—*The Continent (Chicago).*

The Saturday Evening Ghost.—FATHER: "At last I've found a way to make that young scamp of ours stop winking his eyes."

MOTHER: "How?"

FATHER: "I'll show him the article in this Science Magazine where it says that every time we wink we give the eye a bath."—*Mrs. R. Rowe.*

The Mock-Turtle.—Wrecked motorist at phone: "Send assistance at once. I've turned turtle."

Voice (from the other end): "My dear sir, this is a garage. What you want is an aquarium."—*Julia Gross.*

Eclipsed.—During the recent solar eclipse so much publicity was attached with the proposed flight of Army aviators in California to ascend 20,000 feet and take pictures in the path of totality, that around many newspaper offices the eclipse was usually thought of in connection with this flight.

About a week before the eclipse was due, a young newspaper reporter in Washington whose education had been more literary than scientific, telephoned the War Department and asked:

"Can I interview some one there who will give me the details of this eclipse that the Army Air Service is putting on out in California?"—*Lieut. C. P. McDarment.*

A Case in the Short-Circuit Court.—A chap was arrested for assault and battery and brought before the judge.

JUDGE (to prisoner): "What is your name, your occupation and what are you charged with?"

PRISONER: "My name is Sparks, I am an electrician, and I am charged with battery."

JUDGE: "Officer, put this guy in a dry cell."—*The Inland Merchant.*

Easing Up the Jar.—As Rastus was led to the electric chair, an attendant asked him if he had a request to make.

"Well, boss," replied Rastus sadly, "Ah knows I'se goin' on a tough ride, and maybe I could use one of dese here shock absorbers!"—*Chas. Vivier.*

And Seasickness.—TEACHER (to class in chemistry): "What does sea water contain besides the sodium chloride we have mentioned?"

SMART BOY: "Fish, sir."—*James Rogers.*

Digitized by Google
Original from UNIVERSITY OF CHICAGO

THE ORACLE

The "Oracle" is for the sole benefit of all scientific students. Questions will be answered here for the benefit of all, but only matter of sufficient interest will be published. Rules under which questions will be answered:

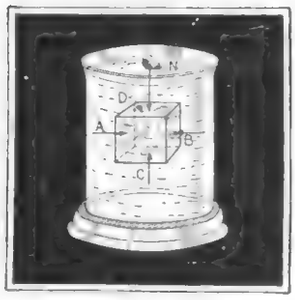
1. Only three questions can be submitted to be answered.
2. Only one side of sheet to be written on; matter must be typewritten or else written in ink, no penciled matter considered.
3. Sketches, diagrams, etc., must be on separate sheets. Questions addressed to the department cannot be answered by mail free of charge.
4. If a quick answer is desired by mail, a nominal charge of 25 cents is made for each question. If the questions entail considerable research work or intricate calculations a special rate will be charged. Correspondents will be informed as to the fee before such questions are answered.

ARCHIMEDES PRINCIPLE

(1599) Jesse Phillips, Philadelphia, Pa., asks:

Q. 1. If a cube of metal is suspended in a liquid, is the pressure exerted upon it by the liquid equal in all directions?

A. 1. Referring to the illustration herewith, faces A and B will be equally pressed upon in



The perpendicular faces of a block of any material suspended in a liquid have exerted thereon equal pressure. The pressure on the upper face depends on the distance to "N" and that on the lower face on this distance and the thickness of the block.

opposite directions. It will also be found that the other pair of lateral faces will have the same pressure exerted thereon. On D, there will be a downward pressure equal to the weight of a column of water whose base is the same size as face D and whose height is equal to the distance from D to N. On the bottom of the cube, C, there will be a pressure equal to the weight of a column of water whose base is of the area of C and whose height is the distance of C to N. This is one of the principles of the mechanics of fluids discovered by Archimedes and from it is deduced the fact that upward pressure on the immersed body at any particular point is the same as that on the fluid which it replaces.

TREATMENT OF CANCER WITH X-RAYS

(1600) John W. Arnold, Urbana, Ill., asks:

Q. 1. Is a patient undergoing the X-ray treatment for the cure of cancer likely to develop other cancers from the use of the rays?

A. 1. With ordinary care a person subjected to cancer treatment by X-ray does not develop X-ray cancer. It is only those who work with the rays continuously that are likely to become so afflicted, but with modern machines this possibility has been reduced to a negligible degree. In the olden days, when tubes were not shielded, such cases were rather frequent.

Radium rays can likewise cause a sort of cancerous growth but the action of radium on an X-ray cancer case is very slight. The best method of treatment of cancer today is excision combined with both radium emanation and X-ray treatment.

SOMETHING NEW

CAN you build a telephone receiver less than ¼ of an inch big, or a loose coupler, or a vario-coupler, or a variometer, or a radio outfit of this size? $200 in prizes will be paid for actual working models of the smallest electric and radio apparatus and appliances. The most novel contest staged in a long time. For full particulars, see page 951 of this issue.

This is only one of the big features of the new and enlarged PRACTICAL ELECTRICS for January. Other features are:

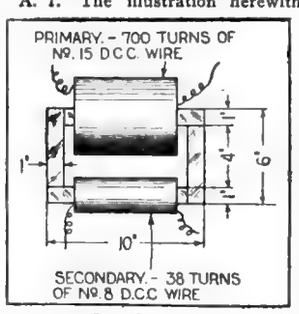
MEASURING CELESTIAL TEMPERATURES
RADIUM
AERIAL RAILROAD
By Raymond F. Yates
ANALOGIES AND OTHERS
By T. O'Conor Sloane, Ph.D.
ELECTRIC TIMING OF HORSE RACES
By Jacques Boyer, Paris Correspondent

100-WATT STEP-DOWN TRANSFORMER

(1601) Jos. P. Rodriguez, New York City, asks:

Q. 1. Can you give me the necessary data for building a step-down transformer giving 6 volts at approximately 16 amperes on the secondary, to be operated on 110 volts A.C.?

A. 1. The illustration herewith gives all the



At the left will be seen constructional details for a 100 watt step-down transformer delivering six volts at approximately sixteen amperes on the secondary. The two coils should be thoroughly insulated from the core.

necessary data for such a transformer. The core should be built up of laminated silicon steel and the legs should be 1 inch square in cross-section.

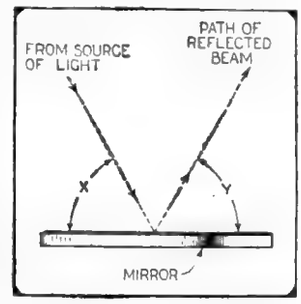
REFLECTION OF LIGHT

(1602) John Harvey, Boston, Mass., wants to know:

Q. 1. In speaking of the reflection of light what is meant by the saying that "The angle of incidence equals the angle of reflection?"

A. 1. The diagram herewith illustrates this rule very clearly. The angle X is the angle of

Whenever a beam of light strikes a reflecting surface, such as a mirror, at a certain angle, it is always reflected away from that surface at an angle exactly equivalent to the first. At the right, angles X and Y are equal.



incidence and the angle Y is the angle of reflection. These two angles are equal in all cases of the reflection of light from a plain surface.

MOTH BALLS

(1603) Mr. Norman Atkinson, Jordan, Minn., requests:

Q. 1. Can you give me a formula for making a preparation similar to that used in making moth balls?

A. 1. If you will melt together four ounces of naphthaline and eight ounces of paraffine wax you will have a production very similar to the ordinary moth balls.

TROUBLE WITH FREEZING MIXTURES

(1604) Anthony Azzopardi, New York City, says that he used the freezing mixture mentioned in this department of this magazine some time ago which consists of ammonium chloride and potassium nitrate. He says that with this he has had no results. He asks:

Q. 1. Can you tell me why the freezing mixture does not work and give me some pointers for using the same?

A. 1. It may be that your chemicals were insufficient in amount and for this reason your freezing mixture will not work. However, if the initial temperature of the water used is about 32° C it will not freeze because the temperature depression of the mixture you mention is only 30° C. Would advise you to try this mixture again using water with a temperature of about 25° C, or even lower. If your chemicals are correct you should have no trouble in obtaining the results you desire.

OUR $12,000 PRIZE CONTEST

YOU will note from this issue, our prize contest has gone over big. Over $1,000 has been paid this month for worth-while contributions to this magazine, either in pictures, suggestions, ideas or articles. There is something doing all the time, no matter where you live, that can be written up for SCIENCE AND INVENTION. All you need to do is to keep your eyes open. Even if you were totally deaf or blind, there would still be a way for you to win a prize simply by using your head and sending us ideas and suggestions of a scientific nature, or of a nature directly or indirectly touching on new inventions.

ARTICLES FOR FEBRUARY SCIENCE AND INVENTION

Taking Photos of the Earth with a Sky-rocket Camera By Raymond Francis Yates
The Secret of Perpetual Youth By Clement Fezandie
Why the Elevation of Our Naval Guns Should Be Increased By Graser Schornstheimer, Naval Expert
Science Serves in New York's Newest Hotel By W. B. Arvin
Electricity and Science in Stock Exchange Operations
A Day with America's Master Model Makers By Joseph H. Kraus
A Gigantic Scheme for Utilizing Power of the Tides
Choosing a Vocation by Machine Methods
Announcement of Winners in the "Single Tube" Radio Receiving Set Contest
The Story of Lime By Ismar Ginsberg
Does a Ship Sailing East Weigh Less Than When Sailing West?
Burning Coal Twice By Ismar Ginsberg
Match Tricks—Second Article By Walter B. Gibson

FREE INFORMATION

IF you want additional information concerning any of the subjects illustrated and described in this number of SCIENCE AND INVENTION, we shall be glad to give you other data we have at our command. To make this work as easy as possible for our editors, please be brief. Write only on one side of the paper and state exactly in a few words just what it is you desire further information on. We have the original manuscripts and drawings of many of these articles in our files and can furnish much additional data in most cases. Please do not fail to send sta self-addressed envelope.

Address all inquiries of this nature to INFORMATION EDITOR c/o Science and Invention, 53 Park Place, New York City.

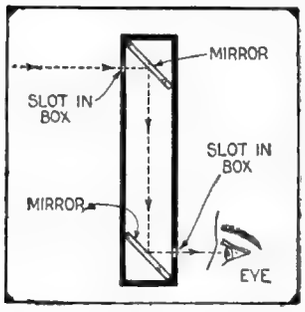
Digitized by Google
Original from UNIVERSITY OF CHICAGO

PERISCOPE PRINCIPLE

(1605) John Blake, Wentham Mass., asks:

Q. 1. Can you show, in simple form, the principle of the reflecting periscope?

A. 1. The illustration in these columns shows the principle of the periscope and also how a very simple type may be constructed. A long narrow box of square cross-section is obtained and two mirrors fitted therein at the ends as illustrated. The surfaces of these mirrors must be parallel and the angles at which they are placed will depend upon the location of the slots in opposite sides of the box. This can best be determined by experiment. By looking in the slot at the bottom of the box, objects can be seen over other objects higher than the level of the eye by turning the periscpoe in the desired direction.



A simple periscope may be made by using two mirrors placed in an oblong box at the angles illustrated. They can be held by means of adhesive tape or glue. Slots are to be cut in the box on opposite sides as illustrated.

TRANSFERRING OF PICTURES

(1606) Paul Redman, Kansas City, Mo., says that he has seen a liquid which is supposed to transfer pictures from newspapers or magazines merely by coating the photograph with the liquid and placing over it a clean sheet of paper. The illustration is then supposed to be transferred to the clean sheet. He asks:

Q. 1. Can you give me any information on such a liquid?

A. 1. There have been various liquid solutions exploited on the market which the makers claimed would transfer newspaper and magazine print to plain paper. However, none of these have been found to give satisfactory results, and as an added drawback, the reproduced printing was reversed. If you have any clippings or other material which you desire to have reproduced, we would advise you to use the photostat method.

2 M. F. CONDENSERS

(1607) Richard Romaine, Iowa Falls, Iowa, asks:

Q. 1. Kindly give me the directions for making a 2 mf. condenser?

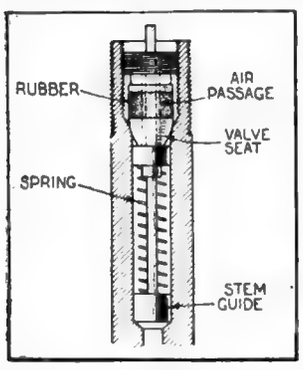
A. 1. A 2mf. paraffin paper condenser would be of too large a size for the average amateur to construct. This construction requires about 35 feet of paraffin paper 4 or 5 inches wide, three of these sheets being necesary. Two sheets of tin foil, two inches shorter and ½ inch narrower than the paper, are also required. However, trouble will almost always be experienced in rolling this condenser up unless it is done by machinery. These condensers can be purchased very cheaply from any electrical supply store.

PNEUMATIC TIRE VALVES

(1608) Robert Mellons, Canton, Ohio, wants to know:

Q. 1. What is the principle of the valve such as used in the stems of ordinary pneumatic tires?

A. 1. The illustration puts forth the construction of the standard type of tire valve. It will be noticed that the valve proper is placed on a central rod and held against its seat by a light spring. Incoming air passes through the openings indicated. The entire mechanism is so placed that the pressure of the air from the inside of the tire forces the valve against the seat, thereby retaining the air in the tire. The spring used is of such a tension that it will allow the incoming air from the pump or compressor to force the valve open. The valve has its cap with rubber packing. This cap is screwed on by hand.



The valve used in the ordinary pneumatic tire is very simple yet positive in operation. The pressure of the air within forces the valve up against the seat thereby sealing the air passage and preventing the escape of air. The spring is used to hold the valve in place.

POTASSIUM PERMANGANATE

(1609) Lewis Baldwin, Croton, N. Y., wants to know:

Q. 1. How may potassium permanganate be made?

A. 1. To make potassium permanganate, you should fuse together equal parts of manganese binoxide, caustic potash, and potassium chlorate. Dissolve the resultant in water and pass carbonic acid gas through the liquid. Filter, and the bright purple solution will be potassium permanganate.

Q. 2. What is formed when hydrochloric acid acts on copper?

A. 2. Hydrochloric acid will act slowly on copper in the presence of air, forming cupric chloride.

Q. 3. Will iron pyrites treated with sulphuric acid form hydrogen sulphide?

A. 3. No.

REDUCTION IN WEIGHT

(1610) O. Shimeton, Oakland, Cal., asks:

Q. 1. If a piece of iron weighing three pounds is placed in a vessel and the air exhausted therefrom, will the vessel weigh three pounds heavier than it would without the iron?

A. 1. If a piece of iron weighing three pounds is placed in a receptacle and the air exhausted from the latter the entire weight will still be three pounds more than the weight of the receptacle alone. This is speaking approximately, for the weight will be slightly less due to the weight of the air which was drawn out of the jar. This would very slightly reduce the total weight.

IMPORTANT

TO NEWSSTAND READERS

IN order to eliminate all waste and unsold copies it has become necessary to supply newsstand dealers only with the actual number of copies for which they have orders. This makes it advisable to place an order with your newsdealer, asking him to reserve a copy for you every month. Otherwise he will not be able to supply your copy. For your convenience, we are appending herewith a blank which we ask you to be good enough to fill in and hand to your newsdealer. He will then be in a position to supply copies to you regularly every month. If you are interested in receiving your copy every month, do not fail to sign this blank. It costs you nothing to do so.

.....

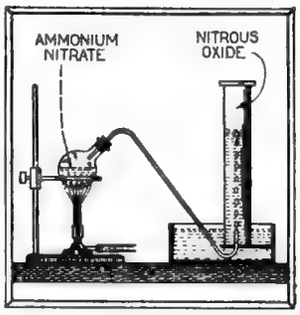
To ..... Newsdealer

Address .....

Please reserve for me ..... copies of SCIENCE & INVENTION every month until I notify you otherwise, and greatly oblige,

Name .....

Address .....



Nitrous oxide may be prepared very easily for experimental purposes by setting up the apparatus as shown. Nitrous oxide is given off by the application of heat and collected.

NITROUS OXIDE

(1611) Ralph Stevens, Brooklyn, N. Y., asks:

Q. 1. How can nitrous oxide or laughing gas be produced in small quantities in the chemical laboratory?

A 1. The apparatus should be set up as illustrated in the diagram herewith and a small quantity of nitrate of ammonium placed in a flask. Upon heating, it will be found that a gas is given off which gas will replace the water in the tall glass cylinder. Some will be lost by solution in the water. This is nitrous oxide.

The nitrate of ammonium necessary for use in this experiment can be bought; it is a regular commercial product.

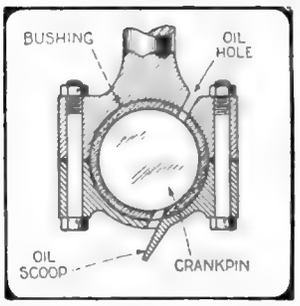
MOTOR LUBRICATION

(1612) J. Simpson, Springdale, Pa., asks:

Q. 1. How are the various parts of the average gasoline engine lubricated? That is, the wrist pins, the crank pins and the cylinder walls and pistons?

A 1. In the majority of internal combustion engines there are small channels in the crank case at right angles to the line of the crank shaft. Into these dip small oil scoops, one of which is located on the end of each connecting rod as illustrated herewith. These scoops throw the oil around inside the crank case and, together with heat, form an oil vapor and spray which penetrates to every part of the engine. The oil also enters the small oil hole shown in the illustration herewith, lubricating the crank pin. This pin is also partially lubricated by the hole placed by the oil scoop as shown. The vapor and spray are continuously forming and keep in circulation throughout the various parts and lubricate all the sections of the engine mentioned in your question. It is termed splash feed.

The oil scoop illustrated at the bottom of the connecting rod, shown in part at the right, throws oil around inside the crank case of a gasoline engine and lubricates the various moving parts by what is known as the "splash system."



CHARGING STORAGE "B" BATTERIES

(1613) Edward Reynolds, Cazenovia, N. Y., says that he has an airplane generator which will deliver 13 volts at 33 amperes and wants to know:

Q. 1. Can I charge a 22½ volt storage "B" battery with this generator?

A. 1. We would not advise the use of the airplane generator you have for charging 22½ volt "B" batteries. Its voltage is too low for this work unless you desire to charge your battery in three different sections, which would of course, consume considerable time.

Q. 2. What is the proper speed for running such a generator?

A. 2. Regarding the correct speed for running your generator, we would have to refer you to the manufacturers.

GENERATOR QUERY

(1614) E. V. Porter, Henniker, N. H., says that he has a D. C. generator rated at 13 volts and 33 amperes and desires to operate the same from a water power plant located 1,300 feet from his house. He asks:

Q. 1. What size wire should I use for conducting the current from the generator which will be located near the water power plant to the building?

A. 1. If you will use No. 6 rubber covered wire for conducting the current from your generators to the house we believe you will have no trouble in lighting the buildings with the resulting current. Of course, in order to insure stable operation of the installation you should use a storage battery, to be charged by the generator and which will deliver current to the house when the generator is not running.

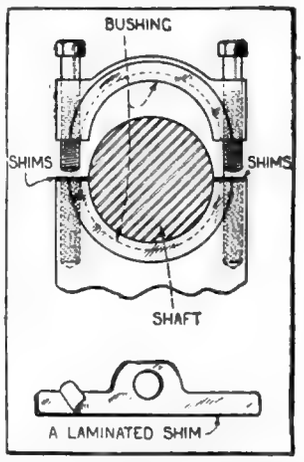
SHIMS

(1615) Jack Bartlett, Chicago, Ill., wants to know:

Q. 1. What are "shims" and of what use are they in automobile engines?

A. 1. A shim is usually made in a form such as shown here and consists of many sheets of very thin copper lightly soldered together so that the leaves can be peeled off leaving a shim of the desired thickness. The leaves are usually one one-thousandth of an inch thick. They are very useful in adjusting bearings to shafts if they are placed in a manner such as illustrated herewith. As can be readily seen, the shims can be removed and peeled down to the required thickness so that the two halves of the bearing will fit snugly on the shaft.

Very thin sheets of copper, soldered lightly together and cut as shown at the bottom of the illustration at the left come in very handy when adjusting connecting rod bearings on automobile engines. They are known as shims and one or more are placed as shown, so that the bushing and the connecting rod may be made to fit snugly.



Digitized by Google
Original from UNIVERSITY OF CHICAGO

START THE NEW YEAR WITH A STARRETT CATALOG

You're going to need new tools this coming year. NOW is the time to start planning.

Send for the Starrett Catalog. You will find it invaluable in making your selection of the tools best suited for your individual requirements.

Over twenty-two hundred fine Precision Tools are described in this Catalog. Illustrations — uses completely described — prices — the newest additions to the Starrett Line — **the whole story in its 350 pages.**

Write for it TODAY. Mailed promptly at our expense. Ask for Catalog No. 22 "LE"

THE L. S. STARRETT CO.
The World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
ATHOL, MASS.

Showing how the Starrett Catalog describes a tool and its uses. This free book has the information you want. Send for it.

Starrett Tools

6005

Digitized by Google
Original from UNIVERSITY OF CHICAGO

FREE Trial Lesson DRAFTING

The coupon below brings this Free Trial Lesson, prepared by the Chicago Tech. experts. Learn from it, before you pay out a penny, how well qualified you are to take up Drafting. While other schools require enrollment and payment of fees at once, Chicago Tech. sends you this lesson first and also information on how to get into the high salaried profession of Drafting by utilizing your spare hours.

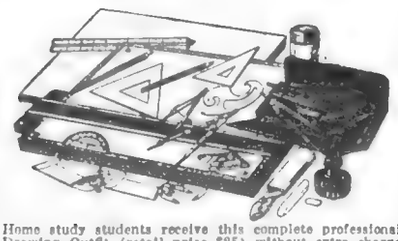
Big Jobs Waiting

Become an expert Draftsman and you can "write your own ticket." Chicago Tech. training enabled Rex Cary to make 4 times his former salary; A. S. Ross soon had a salary increase of $225 a month and J. A. DeCosta who was a laborer became manager through the same training. Your opportunity is as good as theirs. All you need is this training.

Train at Home

You can get this training without leaving your present position. The Chicago Tech. experts will teach you by mail, giving you the knowledge that will make your services always in demand by big industries. No useless theories, no dry text books to study. You work on practical problems and learn the ways of successful high-salaried Draftsmen.

FREE Drawing Outfit



Home study students receive this complete professional Drawing Outfit (retail price $25) without extra charge—or credit for fees if they have outfits.

Send the Coupon

Mail the coupon and get the Free Trial Lesson—also catalogs and full information about the Chicago Tech. Method of teaching Drafting by mail. No cost to you—no promise or obligation on your part. **Send today.**

CHICAGO TECHNICAL COLLEGE

Dept. 145, Chicago Tech. Bldg.,
118 East 26th St., Chicago, Ill.

Without cost or obligation on me please send instructive matter about opportunities in line I have marked with "X."

( ) **Drafting.** (The Big Salary Course). **No experience** necessary. Free Lesson sent now.

( ) **Building Trade Course.** For men in the building lines.

Name .....

Address .....

Post Office .....

.....

The Man On the Meteor

By RAY CUMMINGS

(*Continued from page* 859)

spired in me any emotion stronger than my passions of hunger and thirst? Not so. I was in the full bloom of my manhood, yet the sight of this beautiful woman thrilled me because now I knew instinctively I might find food and water.

I scrambled forward, holding myself to the ground with difficulty, and entered the mouth of her cave like some marauding animal seeking the sustenance I craved.

The cave-mouth gave into a tunnel leading at an angle downward. The walls were smooth. I forced myself down, half sliding, half gently falling. For an instant the thought came to me that I would encounter other living creatures—things to keep me from the food and drink I wanted. Had I met them—humans or beasts—I know I should have fought desperately.

It was dark in the tunnel; but soon I saw that the rocks were glowing with a phosphorescence. This grew brighter as I advanced.

EXPLORATION

I went down perhaps two hundred feet; then the tunnel opened. I was in a subterranean chamber of indeterminate size, possibly five hundred feet square, with a black rocky ceiling some fifty feet above me. The whole place was dimly lighted by the red-silver glow which came from the rocks. The air was denser, with a pungent, aromatic odor. It seemed to strengthen me and clear my head.

The sides of the cave were rough and broken with overhanging rocks like shelves. Here and there were other small tunnel-mouths. Most important of all, a small subterranean stream crossed the cave, opening up into a little lagoon near the center. It was a thin-looking, milk-white fluid. I flung myself down to it with a splash.

It tasted, not like milk, but like pure, cold water, though very thin and light. I drank my fill. The joy of it!

There was a pile of blue fabric—woven grass—on the bank beside the stream. The girl's couch, it proved to be. The robes were very soft, gossamer in weight. I started to dry myself upon one of them. But the water—I shall call it that—evaporated like alcohol, and I was dry in a moment.

There was food here. A patch of black soil had queer, fungus-like growths in it. I had no doubt it was the girl's food. There were the remains of a fire, though I did not know what it was at the time. On a stone was some of the fungus which had been cooked. Of this I ate.

Upon the couch I lay at ease. The blue robes lay around me like swan's down. My slight weight made me seem floating in them. It was my first conscious moment of physical peace.

With hunger and thirst appeased, my thoughts turned to the girl. She was not only the first woman, but, to my memory, the first living thing I had ever seen. Where was she now? Could I capture her?

Across the cave I saw something move. The mouth of a passage-way was there beyond the stream; and in the dim glow of light I could make out the girl standing there. She was watching me as I lay in possession of her couch.

I held myself motionless. After a moment she began coming forward, timidly, yet curiously to inspect me. She stopped at the edge of the stream no more than fifty feet away. Her hair fell in waves to her knees. She stood hesitating, frightened, yet drawn by a power greater than her fear. I could see the muscles of her limbs tensed for instant flight.

I had intended to leap suddenly across the stream but a strange shyness came over me. Instead, I called to her. Words? I had no spoken language. I called some syllable. It startled her; but she answered—a soft little call of shy friendliness.

I wanted her to come to my side of the stream, but she would not. I beckoned to her; but she moved backward on fairy-like tip-toed steps. It angered me. I waved my arm vehemently and tried to climb to my feet, struggling with the airy, half-floating robes of the couch.

The girl took flight. Her arms struck out, and like a swimmer mounting through water she floated up to the ceiling, landing upon a ledge of rock. Through a tangle of her hair her face peered down at me. And though her eyes were frightened, there seemed an impish, mocking expression to her tremulous smile.

Shyness dropped from me. She would obey me; I would make her. I kicked myself into the air and swam as I had seen her swim. But it was not as easy as it looked. I turned over in the air, losing my balance in spite of myself.

THE CHASE

I reached the ledge, striking my shoulder violently upon it as I landed in a heap. But she was not there. Across the cave, down by the couch she stood poised on tip-toe, looking at me. And this time her red mouth and dancing eyes were openly mocking.

For half an hour I pursued her about the cave; but she eluded me as easily as though she had been a butterfly and I one of your Earth-children in eager chase. She could have escaped from the cave, but she had no fear of me now. At last, bruised and exhausted by my futile efforts, I sank upon her couch; and again she stood nearby, regarding me.

I was angry and sulky. I pretended to disregard her. At last, utterly worn out, I fell asleep.

IV

When I awoke, the girl was sitting beside me. Her soft fingers had been stroking my hair; it was their touch which awakened me. As I moved and opened my eyes, she instantly withdrew beyond my reach.

I was hungry again and when I motioned to her and indicated the food, she seemed to understand. I sat quite still, and within a few minutes she was deftly preparing a meal. But I was aware that she watched me narrowly and seldom came within my reach.

The fire she produced by rubbing two stones together. It seemed to ignite the stones, with a tiny flickering flame like the burning of sulphur. She had gathered a pile of dried vegetation from the surface above the cave; and when that was blazing she added rocks that glowed like coal. The fire interested me tremendously. It alarmed me; but only at first, for I saw that the girl had no fear of it.

I need not go into details. Her manner was proud when presently she indicated the hot food ready to eat and she watched me expectantly while I tasted it. I smiled my approval and beckoned her to take some of it with me. At which she curled up on the

(*Continued on page* 906)

Digitized by Google Original from UNIVERSITY OF CHICAGO

Tighten Your Grip on a Trade

Be An Electrical Expert

At $75 to $200 a Week

Every up-to-date fellow knows what a future there is in electricity.

Big pay—fascinating work on land or sea—rapid advancement in a field where jobs are ten times more numerous than trained men to fill them, where $75.00 a week is just a fair starter, where top notchers pull down ten thousand dollars or more a year—in a field, where any man if he wishes, can easily have a business of his own, have men working for him, be his own boss!

But what the average young man does NOT know, is what a simple, easy, A-B-C sort of a job it is to get started.

You Can Start Right Now!

Yes, you. You don't need a thing you don't already have! You can read. You can write. You can figure. You can think. And in your breast is the fire of ambition—the desire to get ahead! All right, that's all you need—we can help you just as you are—just as we have helped scores, yes, thousands of other two-fisted young fellows determined to get out of the rut and into the electric field—into work that will be pleasant—easy—and all in your home, during spare time.

Fascinating Home Study As You Hold Your Old Job

With the help we will give you, you can slip right into one of these big pay—he-man jobs and never lose a day's work. After a few weeks' start, you can earn enough in installation and electric repair jobs alone to more than pay for the Course and lay a foundation for an Electrical Contracting or Repair Shop Business of your own. When the proper time comes, we will tell you the easy way to go about doing it.

The Most Practical, Thorough and Condensed Electrical Course Ever Written

This is the only home study electrical course that gives you the combined practical and theoretical training you must have before you can be a successful electrician without which you cannot succeed—with which you cannot fail.

Written not by ONE man, with the narrow one-man viewpoint, but by 22 of the brainiest, most successful, electrical experts ever drawn from the field of practice and theory. Gives you the complete mastery of the subject—qualifies you as electrical expert to boss jobs—fits you right into the kind of a job you want—and does it in shortest time—at lowest cost—with the

Most Binding Guarantee of Results Ever Offered!

Satisfaction guaranteed or **no sale!** We not only SAY we can make you an electrical expert, we Guarantee it! If you are not absolutely satisfied when you have finished our Practical Electrical Course, we will refund every nickel you sent us.

FREE! **Experimental Outfit Worth $30**
Drafting Course Worth Another $30
Big Electrical Library Worth $25

Find out all about our offer. Find out about the thousands who have taken this course in preference to all others and MADE GOOD. Find out about the Electric Library—four elegant volumes—worth $25, but free. About the free Drafting Course worth another $30. The free Experimental and Demonstration Outfit, including a real, not a make-shift Electric Motor, Wheatstone Bridge, etc.—the most scientific, high-grade and complete Experimental Outfit ever supplied with a Course in Electricity. Get all the facts without obligation, without expense! Just send the coupon!

American School

Dept. E-126 **Drexel Ave. and 58th Street, Chicago**

FREE Electrical Coupon

American School, Dept. E-126, Chicago
Please rush all information relative to your Course in Electricity. This obligates me in no way whatever.

Name.....

Address.....

.....

Digitized by Google

Original from UNIVERSITY OF CHICAGO

Learn COMMERCIAL Electrical Engineering *in One Year*

To fill the ever increasing demand for electrically trained business men, consulting and efficiency engineers, men who can handle commercial engineering problems, we offer a thorough, condensed, and very practical course to high school and Electrotechnician graduates.

We teach by practical work and scientific methods under practical working conditions. Specialists for 18 years in training young men for

Electrical Engineering with B. S. Degree in 3 years

Electrotechnics 1 to 2 years. Electrical and Mechanical Drafting 9 months. Automotive Electricity 3 months. Armature Winding and Motor Generator Repair 3 months. Practical Electricity 6 months.

A place for every student regardless of age or education. Up-to-date laboratories, faculty of experts, individual instruction. Students' Activities. Radio Broadcasting Station. W.I.A.O. Winter Term now open. **Big Book FREE.**

SCHOOL of ENGINEERING of Milwaukee

Founded 1905

School of Engineering of Milwaukee,
Dept. S&I-1-24B, 415 Marshall Street, Milwaukee, Wis.

Without obligating me in any way, please mail free illustrated book and further particulars on the course I have marked with an X.

....Commercial Electrical Engineering
....Electrical Engineering, B.S. Degree
....Practical Electricity
....Drafting
....Electrotechnics
....Automotive Electricity
....3 mo. Armature Winding Course
....3 mo. Light and Motor Wiring Course

Name .....

Address .....

City ..... State.....

Education ..... Age.....

The Man on the Meteor

(*Continued from page* 904)

robe beside me, eating the food I pushed toward her.

We were friends. Like myself, she had no spoken language. But when we tried to talk it came fast. I indicated myself and told her I was Nemo. The word seemed to spring readily to my mind; I have no doubt it was some part of my earlier life. She had no name. I called her Nona. It seemed to please her. She repeated it after me half a dozen times, and clapped her hands delightedly.

LEARNING TO TRAVEL

A little later we went up to the surface of our tiny world. It chanced to be daylight; and Nona taught me how to swim through the air, how to handle myself against this lack of gravity.

The art came to me quickly. I was soon able to swim about with swift, powerful strokes. My stronger muscles gave me an advantage over her. I could swim more quickly; but I could never attain her deftness, her agility. She would swoop about, dive head downward in a graceful arc, right herself and land on tip-toe.

We circled our little globe, swimming at an altitude of a hundred feet, and following the Sun; and within half an hour were back at our starting point. Everywhere I saw the same bleak landscape. It was night when we returned, for we had overtaken the Sun and passed it. But in a few moments daylight came again.

Then Nona showed me how to jump. With arms folded, she leaped vertically into the air. Straight up her body shot, her hair brushed flat against her by the downward rush of wind. She held herself upright by throwing out a hand occasionally. Like an arrow she mounted; until standing on the ground I could see her only as a tiny dark speck against the blue of the sky.

She came swimming down a few moments later, her hair waving like a cloak behind her, spun gold with the sunlight on it. She was laughing and flushed from the exertion.

Then at arms length with fingers clasped, we leaped upward together. The tiny world dropped away. Looking down, it showed itself as a ball. I could see far around it.

We seemed to mount endlessly. The air grew so rare I gasped for breath. My head was roaring. I was cold. Below, I could see the spherical meteor turning under us. We were in Space, no longer a part of our world. And we had almost reached the limit of its atmosphere.

Nona's fingers clutched mine tightly. Suddenly she twisted me downward and dropped me. A strong side wind had sprung up. We swam down against it, fighting our way until at last we were back to the meteor's surface.

I was tired, for through my clumsiness I had used far more energy than Nona; but I would not let her see it. I saw her look upon the muscles of my arms and shoulders, and her admiration pleased me. I stretched my arms for her, showed her the muscles of my legs; and looked about for some way of displaying my prowess. There were many boulders around that could be loosened. One by one I flung them into the air, sent them into Space never to return.

MOVING MOUNTAINS

Nona watched me with awe, encouraging me with little syllables of pleasure as I selected larger and larger rocks. Some I dug up and tore loose, until at last I ripped off the top and side of a hill. It was a mountain of rock. I staggered like Atlas, with it over my head, and then launched it into the air. It rose a short distance, and fell back to form another hill.

Nona gazed at me with new respect and with a look in her eyes that made my heart pound. I was casting about for some larger burden, but she drew me away.

I was pleased. A sense of my own power filled me. I was master here on this world of mine. I could have taken it apart bit by bit and tossed it into Space. I could tear down mountains, build others in their stead.

Facts and figures? I am in a position now to give them to you. My meteor had a diameter of five miles, a circumference of some fifteen. Its density relative to Earth was .67. Its surface gravity—again relative to your Earth—was .00039 placing Earth as 1.00. My weight at the surface of my meteor—neglecting other factors which I shall name in a moment—was slightly over one ounce.

Without undue exertion I could leap upward nearly ten thousand feet—that is to say, almost two miles. And the mountain of rock I tossed into the air on your Earth would have weighed some 320,000 pounds!

I have said that the boulders I tossed upward left the surface of the meteor never to return. At an initial velocity of 13 feet a second, all objects became satellites of the meteor, revolving about it comparatively close to the surface in perfect circles. The velocity of escape was but 18½ feet a second, i.e., that velocity which would cause an object to pass into outer Space, moving onward until it found some larger body to encircle.

(*Continued on page* 908)

The Hammond Typewriter has been acknowledged for years the only adequate writing machine for technical and scientific subjects, in the laboratory. Its interchangeable types include special arrangements for every kind of scientific work, including superior and inferior fractions, astronomical signs, etc. (Special sheets showing the use of the Hammond in various technical fields will be supplied upon request.)

Hundreds of New Uses for this versatile Hammond

Think of a single typewriter that can use over 50 different type styles, sizes and languages—all instantly interchangeable.

What Variable Spacing Means

Small types are narrower than large sizes, so every Hammond has *Variable Spacing*—10 characters to the inch for large sizes, and 14 or 18 to the inch for smaller types—changed at the touch of a button, to fit the size type in use.

THE NEW Hammond TYPEWRITER

VARIABLE SPACING CHANGEABLE TYPE

Hammond Typewriter Corp.

544-A East 69th Street New York

The Folding Portable Hammond every feature of the desk type. Is only 8½ lbs.

Two type styles or languages are in the machine all the time, changed at the turn of a knob. Others can be instantly substituted.

It all but speaks!

Digitized by Google

Original from UNIVERSITY OF CHICAGO

McGraw-Hill Home Study Courses

"Know your work as experts know it and get an experts pay"

These famous books will help you win a big-pay job in your chosen work

OVER 100,000 men are stepping ahead in their work with the aid of McGraw-Hill Home Study Courses. These courses enable a man to skip over the long years of hard work and low pay—they show him how to fit himself, easily and quickly, for bigger things in electricity, machine shop work, electrical maintenance and repair, and power plant engineering.

Practical subjects taught by practical men without the aid of correspondence instruction

EACH of these courses is a complete educator in itself. All the facts —all the information you may wish to have about any particular subject is before you ready for instant use. There is a minimum of theory, and every line and every illustration will be found clear and understandable by even the beginner.

A lifetime of experience packed within these books

These courses contain more information than any one man could acquire in a whole lifetime of practice. The books have been written by men who are acknowledged leaders in their field—men who have lived and worked with the very problems they write about. They are books by experts, and by studying them you, too, can become an expert and earn an expert's pay.

The Croft Library of Practical Electricity

8 vol. 3000 pages—2100 illustrations.

40,000 sets of this great library are now in use—without a doubt the greatest sale ever attained by an electrical library. The books cover the entire field of electricity, from the fundamental principles to central station work —from the operation of electrical machinery to outdoor and indoor electrical illumination.

$19.50, payable $1.50 in 10 days and $2.00 a month.

American Machinists' Library

6 vol. 2000 pages—2500 illustrations.

This is the 1923 edition of this famous work —completely revised and brought up to date, with many new volumes added. The set is packed to the covers with the kind of information that every machinist, every apprentice, every toolmaker and shop foreman wants.

$15.00, payable $1.00 in ten days and $2.00 a month.

Electrical Maintenance and Repair

5 vol. 1736 pages—1818 illustrations.

The only library of its kind. Contains the largest collection of practical methods for electrical repair and maintenance men ever put together. Covers wiring diagrams, armature winding, motor repair, connecting induction motors, electrical machinery and electrical methods of all kinds.

$14.00, payable $2.00 in ten days, and $2.00 a month.

Power Plant Practice

9 vol. 3978 pages—3778 illustrations.

Cost over $80,000 to produce. The books cover everything that the power plant engineer needs to know to fill a big-pay position. Thousands of first-hand facts—thousands of specially-drawn illustrations. Practical from preface to index.

$19.50, payable $1.50 in ten days, and $2.00 a month.

Only 7 cents a day for the course you select

Check on the coupon the course you wish to see and we will send it to you, all charges prepaid. No expense—no obligation. If you keep the books, pay for them on our easy terms. If they are not what you want, send them back to us at our expense.

Mail this FREE Examination Coupon

FREE EXAMINATION COUPON

McGraw-Hill Book Company, Inc.,
370 Seventh Ave., New York

Send me for 10 days' Free Examination the library checked below. If satisfactory I will send first payment in 10 days and the balance at the rate of $2 a month until the full price has been paid.

( ) Practical Electricity, 8 vol. $19.50.

( ) American Machinists' Library, 6 vol. $15.00.

( ) Electrical Maintenance and Repair, 5 vol. $14.00.

( ) Power Plant Practice, 9 vol. $19.50.

Signature .....

Residence Address .....

City and State .....

Your Employer .....

Your Occupation .....

S.&I.-1-24

Digitized by Google

Original from UNIVERSITY OF CHICAGO

"Another $50 Raise!"

"Why, that's the third increase I've had in a year! It shows what special training will do for a man."

Every mail brings letters from some of the thousands of students of the International Correspondence Schools, telling of advancements won through spare-time study.

How much longer are *you* going to wait before taking the step that is bound to bring you more money? Isn't it better to start *now* than to wait for years and then realize what the delay has cost you?

One hour after supper each night spent with the I. C. S. in your own home will prepare you for the position you want. Without cost, without obligation, mark and mail this coupon. *Do it right now!*

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6217-C, Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject *before* which I have marked an X:

BUSINESS TRAINING COURSES

☐ Business Management
☐ Industrial Management
☐ Personnel Organization
☐ Traffic Management
☐ Business Law
☐ Banking and Banking Law
☐ Accountancy (including C.P.A.)
☐ Cost Accounting
☐ Bookkeeping
☐ Private Secretary
☐ Spanish ☐ French
☐ Salesmanship
☐ Advertising
☐ Better Letters
☐ Show Card Lettering
☐ Stenography and Typing
☐ Business English
☐ Civil Service
☐ Railway Mail Clerk
☐ Common School Subjects
☐ High School Subjects
☐ Illustrating

TECHNICAL AND INDUSTRIAL COURSES

☐ Electrical Engineering
☐ Electric Lighting
☐ Mechanical Engineer
☐ Mechanical Draftsman
☐ Machine Shop Practice
☐ Railroad Positions
☐ Gas Engine Operating
☐ Civil Engineer
☐ Surveying and Mapping
☐ Metallurgy ☐ Mining
☐ Steam Engineering ☐ Radio
☐ Architect
☐ Blue Print Reading
☐ Contractor and Builder
☐ Architectural Draftsman
☐ Concrete Builder
☐ Structural Engineer
☐ Chemistry ☐ Pharmacy
☐ Automobile Work
☐ Airplane Engines
☐ Agriculture and Poultry
☐ Mathematics

Name.....
Street Address.....
8-3-23
City.....State.....
Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

32 CAL. OFFICER'S MODEL AUTOMATIC
Special sale on these 10-shots Automatics. Real blue steel, not cast iron. Limited supply. A wonderful value at $12.75
25 calibre Army Automatic $7.75
German Mausers, 25 and 32 calibre.....$13.95
German Luger, 30 calibre.....$19.95
Break-open Revolver, 32 or 38 cal.....$8.75
All guns shoot standard cartridges and are guaranteed brand new.

Send No Money just your name and address. Pay postman plus postage on delivery. You MUST be satisfied. Money back if you're not.

REPUBLIC TRADING CO.
Dept. 555, 25 West Broadway, New York, N. Y.

The Man on the Meteor

(*Continued from page* 906)

I give these figures without corrections for atmosphere, axial rotation of the meteor, or the attraction of other bodies. Theoretically they are accurate, though in practice they were altered somewhat. During our brief days we weighed more than I have stated; while at night, less. Indeed, had we essayed to jump into the air at night, we should doubtless have been unable to struggle our way back.

How can that be, you ask? Our proximity to Saturn! Around this great planet we were revolving at a distance of no more than thirty-five thousand miles. Saturn's surface gravity is a trifle greater than that of your Earth—1.07 to be exact. Saturn's density is only one-ninth that of the Earth; but the difference is made up because of its tremendous size. Saturn's gravity—to us on the meteor—was an appreciable pull, even though diminished by the distance between us, and further offset by the meteor's rapid rotation.

Thus, you see, when Saturn was below us—in daytime—its gravity was added to ours. But at night, when it was in the sky above, it was subtracted.

These conditions applied to the days I am describing. Our meteor was then between Saturn and the Sun. Later in our year, when we had passed around Saturn, the Sun was blotted out. There was then no daylight—merely alternate periods of a sky filled with Saturn's silver disk and the azure, star-filled outer Space.

I have not mentioned the time of our meteor's axial rotation. It was, as you on Earth measure time, 2 hours, 58 minutes. A complete day and night in less than three hours!

GLORIOUS NIGHT

When I had finished showing Nona my strength, it was night again. And such a night! Saturn no more than thirty-five thousand miles away! The darkened bands were plainly visible. When fully overhead, the circular limb of the planet came down in all directions almost to our horizon. The silver light from it was dazzling. And everywhere in the sky, meteors like ourselves were whirling past—silver in Space, flaming red when fragments of them struck our atmosphere.

Occasionally a meteorite would strike our surface, but we had no fear of them. For an hour perhaps, we stood together, silent, gazing with awe at these mysteries of the sky. Until at last Nona gently drew me back to her cave.

V

Within the cave the air seemed warmer than before perhaps because I was flushed and tired from my exertion. The radiant light from the rocks was soft. Here all was quiet and peace.

At once I threw myself upon Nona's couch, stretching my limbs, head pillowed upon my crooked arm. For a time, as before she stood regarding me. There was in her gaze now no fear, but a curious softness. I sensed it. With sudden thought she smiled, and swam across the cave. She got a stone, hollowed out like a cup. She filled it at the stream and offered it to me. I drank gratefully.

Again I was conscious of hunger. The fungus-like food was unsatisfying. I made Nona understand, and she seemed distressed. I could see she wanted to feed me but had no other food.

Finally she motioned me to lie quiet. I watched her as she stretched herself prone on the ground near me. Her head was raised; she was looking keenly, carefully about the cave. Then she began swimming, slowly, stealthily no more than a foot or two above the cave floor circling about, up along the walls, back overhead following the line of the ceiling.

Once, when she was hovering over by the side wall, I saw her grow suddenly alert. I followed her steady gaze; and on a rock fifty feet from her I made out the outlines of something lying motionless. It was the exact color of the rock itself. It looked like a lizard some three feet long, with white eyes standing out from its forehead. It was because of the eyes that I first saw it.

Nona was in midair. Then, like a wasp she darted at that thing on the rock.

MEAT FOR FOOD

The lizard—I shall call it that—saw her coming. It leaped, and sailed across the cave. I saw that it had webbed membranes connecting its six outstretched legs.

Nona turned in the air after it, her slim body as sinuous as her waving hair itself. She was faster than the lizard, but again, on the opposite side of the cave, it eluded her.

Back and forth across the cave they went. Often the reptile would dash for one of the passageways but Nona with her greater intelligence, always anticipated it and was there to bar its way.

The lizard seemed jointed all over, and it could turn in the air with extraordinary swiftness. But not so swift as Nona. Once the reptile whirled back and forth on a sustained flight. Nona followed its every twist and turn as one bird follows another.

At last she had it in her arms, in midair at the center of the cave. Calling to me in triumph, she struggled with it, fighting her way down to the ground.

I started toward her, but her voice and gesture waved me away. The lizard was screaming—a shrill, hideous scream. But she had its back bent across her knee. Its spine broke with a crack. It lay still.

By one foreleg she held its quivering body up to me; she was laughing with happiness as she sought my applause.

We ate the meat of its tail and legs; and satiated, I lay somnolent on the robes and watched Nona moving about the cave. She extinguished the fire, and at last approached me timidly. I did not notice her. My eyes were half closed. I was vaguely planning my own hunting for food—wondering if there would be other reptiles larger, for me to capture.

A twitch at the coverings on which I was lying aroused me. Nona was pulling a robe out from under me for herself. I pushed it toward her.

I did not move. It was very soundless in the cave with only the murmuring of the stream. Nona curled up on her robe near me. Thus we lay silent; but I felt her shy gaze always upon me and suddenly I came back to complete wakefulness.

We stared wordlessly at each other until her gaze timidly dropped. With heart racing, I moved myself slowly toward her. I was afraid to frighten her; but she moved, not away, but to me. Abruptly my arms were around her.

Thus I found my habitable world and my mate—beyond which the legitimate needs of man do not go

(Co ... e 910)

Digitized by Google
Original from UNIVERSITY OF CHICAGO

NATIONAL
Apparatus of Simplicity and Perfection

The Monodyne circuit is one of the most radical advances in Radio engineering. Parts heretofore considered essential are omitted. One simple tuning control gives selectivity, equal if not superior to sets costing hundreds of dollars.

NATIONAL
"GOLD-GRAIN"
DETECTOR

For Reflex and Crystal Sets

$1.00

Actual Size
FOR PANEL MOUNTING

All Wave Lengths

2 coils are furnished with each set.

NATIONAL
MONODYNE
PAT. TRADE MARK PDG.
TUBE SET
MODEL GT-1

$10.00

Including Two Inductance Coils Without Tube

Entirely New Circuit
No Storage Batteries

Amplifies As It Detects
ONLY ONE CONTROL!

THE SINGLE TUBE
Performs the Function of 2-Tubes
AS RADIO FREQUENCY AMPLIFIER AND DETECTOR

OVER
1000 Miles

NATIONAL
INTERFERENCE ELIMINATOR

The National Interference Eliminator can be used with any and all radio outfits no matter what make, tube or crystal sets. Will bring in stations you never heard before. Nothing else required with set as illustrated. Just connect it with two short wires to your outfit.

$7.50

Dear Sirs:—When your Monodyne sample arrived, to be entirely frank, we did not believe it capable of doing very much on long distance work. After carefully testing the set, we feel that we owe you an apology.

The National Monodyne naturally percolated all over the place; we heard Davenport, Chicago, Dallas, Texas and Atlanta, Ga. The next night we took it to the home of Mr. McCreary, President of the Western Radio Company here, and we heard another string of stations, using the WD-12 tube with two 22½ "B" batteries.

Your Monodyne is certainly a wonder and we should be very glad to stock and advertise it locally.

We are enclosing our initial order, which kindly rush.

Yours very truly,
The Radio-Electric Shop, Inc.
225 East Tenth St., Kansas City, Mo.

An Absolute Necessity to Clear Reception
Eliminates broadcasting and code-signal interference
Can be used to increase or shorten wave lengths

Dealers, Jobbers and Distributors—Send for Samples and Prices

NATIONAL AIRPHONE CORPORATION
20 HUDSON ST. NEW YORK

SEND NO MONEY

NATIONAL AIRPHONE CORPORATION S. I. 1-24
20 Hudson Street, New York City, N. Y.

Gentlemen:

Please send me prepaid the articles crossed, for which I will pay postman upon delivery the advertised price.

One ☐ National Monodyne
One ☐ Interference Eliminator
One ☐ Panel Detector

NAME .....

STREET .....

CITY ..... STATE...

Digitized by Google
Original from UNIVERSITY OF CHICAGO

HIGH SCHOOL COURSE IN TWO YEARS

You Want to Earn Big Money!

And you will not be satisfied unless you earn steady promotion. But are you prepared for the job ahead of you? Do you measure up to the standard that insures success? For a more responsible position a fairly good education is necessary. To write a sensible business letter, to prepare estimates, to figure cost and to compute interest, you must have a certain amount of preparation. All this you must be able to do before you will earn promotion.

Many business houses hire no men whose general knowledge is not equal to a high school course. Why? Because big business refuses to burden itself with men who are barred from promotion by the lack of elementary education.

Can You Qualify for a Better Position?

We have a plan whereby you can. We can give you a complete but simplified high school course in two years, giving you all the essentials that form the foundation of practical business. It will prepare you to hold your own where competition is keen and exacting. Do not doubt your ability, but make up your mind to it and you will soon have the requirements that will bring you success and big money. YOU CAN DO IT.

Let us show you how to get on the road to success. It will not cost you a single working hour. It costs you nothing but a stamp.

American School

Dept. H-126 Drexel Ave. & 58th St., Chicago

American School
Dept. H-126 Drexel Ave. and 58th St., Chicago
Send me full information on the subject checked and how you will help me win success.

.....Architect	.....Lawyer
.....Building Contractor	.....Machine Shop Practice
.....Automobile Engineer	.....Photoplay Writer
.....Automobile Repairman	.....Mechanical Engineer
.....Civil Engineer	.....Shop Superintendent
.....Structural Engineer	.....Employment Manager
.....Business Manager	.....Steam Engineer
.....Cert. Public Accountant	.....Foremanship
.....Accountant and Auditor	.....Sanitary Engineer
.....Bookkeeper	.....Surveyor (& Mapping)
.....Draftsman and Des'gner	.....Telephone Engineer
.....Electrical Engineer	.....Telegraph Engineer
.....Electric Light & Power	..... High School Graduate
..... General Education	.....Fire Insurance Expert
..... Vocational Guidance	.....Wireless Radio
.....Business Law	.....Undecided

Name.....

Address.....

The Man on the Meteor

(*Continued from page* 908)

VI

NOTE TO READER

The foregoing manuscript was written by an old man—known only as Nemo—who is at present an inmate of one of our State Homes for the Aged. His case is a curious one. The Institute authorities inform me that two years ago he was found wandering on the streets of Chicago, the victim, apparently, of amnesia. He had no idea who he was, nor could he give any details of his past life. No papers of identification were found upon him.

I talked with the old man personally for some hours. He is undoubtedly cultured, and with a wide, though eccentric scientific knowledge. He speaks English with an extraordinary indefinable foreign accent—an accent which leaves one wholly in doubt as to his possible nationality.

His memory has never returned. No trace of friends or relatives has been found. At the Institution, because of his pleading, he is known simply as Nemo.

Though the events of his later life are still a blank, Nemo insists that he can remember, with a clarity which increases daily, the events of his youth. The authorities scoff; they tell me he was doubtless at one time some obscure scientist, possibly of Europe. Efforts are being made to identify him.

You have read Nemo's written narrative of his first conscious memories. He gave it to me at my request; and with a cynicism for which I cannot blame him, assured me that no one would credit it. I have made almost no changes; you have it practically as he wrote it.

For myself, I liked the old man. His personality is distinctly likable, and his manner convincing. I can testify that his sole appearance of irrationality lies in the extraordinary things he has to tell. And in these present days of science when nothing seems wholly impossible—and when, as always through history, the thoughtless find it easiest to scoff—I can offer no opinion. I leave you to be his judge.

RAY CUMMINGS.

Dr. Hackensaw's Secrets

By CLEMENT FEZANDIÉ

(*Continued from page* 861)

they found themselves in a small closed chamber. A door in this chamber immediately opened and gave access into a street of Submarina.

"You see, Silas," remarked Doctor Hackensaw, "we're pretty safe here. Even if an enemy discovered our hiding place, he would find it difficult to injure us. We could easily protect ourselves against attacks from submarines, and I doubt if even depth bombs could do us much damage. In fact the whole city, like a ship, is built in air-tight compartments. If one is damaged we can take refuge in another. The central city is some distance away. In fact we must take the electric trolley car to get there."

"What!" cried the reporter, amazed. "A trolley car here, under the ocean?"

"Of course. You don't suppose I am going to give my men any more work than is necessary. Every labor-saving device I can think of is installed here."

THE SUB-SEA CITY

It did not take Silas long to realize that he had come to a real city. The streets, lighted by diffused electric light, were as bright as if the sun were shining overhead. They bore names and numbers, and were kept spotlessly clean. The air was pure and sweet—a regular ocean breeze pervading.

"How is it the air here is not under pressure?" asked Silas. "I understood that the air pressure on the earth is about 15 pounds to the square inch. Every thirty-two feet depth of water adds 15 pounds more. Hence half a mile under water the pressure should be 1,252½ pounds per square inch."

"You are right about the water pressure, Silas, but my air taken from the sea level has barely little more weight than normal air. Half a mile more of air in the column does not greatly increase the weight."

"But how do your receiving chambers and the roof of your city stand the enormous water pressure?"

"My receiving chambers and my entrance wells have thick walls of the strongest metals I can obtain. The city itself is excavated so far under ground that there is little danger. You will notice that the car is going down a rather steep incline."

To say that Silas was amazed would be to put the matter mildly. He could scarcely believe his eyes as he went from one surprise to another. The streets were filled, not only with laborers, but with clerks, stenographers and other professional people, and even with children. Theatres, moving-picture shows, restaurants and ball rooms advertised their various attractions. There was a bank, and there were even stores, but, as the doctor explained to Silas, all the stores and recreation centers were under his own management and were run at cost. The stores would furnish anything wanted, sending to England for it if necessary. Only two things were noticeably different from the ordinary city—here there were no automobiles and no horses.

BOTH WERE TABOOED

Silas was deeply impressed. "I wondered how it was," said he, "that you were able to get help in your submarine city, but now that I have seen it, I am not surprised. Your workmen have all the comforts of home here."

"Yes, we receive all the principal books, newspapers and magazines, and we even publish a journal of our own. 'The Submarine Daily Swash.' We have telephones and electric lights and all modern conveniences in every house, even including radio receiving sets to receive the 'broadcasts' from England. But here we are at the oil wells. Let's get out and visit them."

THE OIL WELLS

"How do you dispose of your crude oil?"

"I have a secret pipe line which carries it to an English refinery I have started. We also refine oil from Europe, though our greatest supply comes from here. I furnish gasoline to England and France cheaper than any one else can supply it. My only doubt is whether or not I am benefitting the world by so doing."

"I don't understand you."

"What I mean to say is that I am a firm

(*Continued on page* 912)

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Radio Catalogue Free—

Write us a post card—
Address Dept. 40-R

and we will send you free this 52 page catalogue of radio sets and parts. It also contains explanation of radio terms, map and list of broadcasting stations and much radio information, including an explanation of successful hook-ups and circuits.

You will be amazed at the low prices Ward's quote. A complete tube set having a range of 500 miles and more, including tubes, head set, batteries, and antenna equipment, as low as $23.50.

This catalogue contains everything for the expert and amateur. Complete sets and every improved part for building sets, all the most up-to-date devices—at the lowest possible prices.

Headquarters for Radio

Montgomery Ward & Co. is headquarters for Radio, selling everything direct by mail without the usual "Radio-profits." Why pay higher prices? Ward quality is the best and the prices will often save you one-third. Everything sold under our Fifty Year Old Guarantee,—Your Money Back if You Are Not Satisfied. Write today for your copy of this complete 52-page Radio Book.

Write to our house nearest you. Address Dept. 40-R
Chicago Kansas City St. Paul Portland, Ore. Ft. Worth

Montgomery Ward & Co.

The Oldest Mail Order House is Today the Most Progressive

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Violet Ray

ONLY $1.00 brings this complete, scientific Violet Rays outfit to you. Treat yourself and family at home, save delay, costly doctors and medicines. Thousands use Violet Rays at home to relieve pain and sickness. The identical outfits doctors have bought from us for years and with which they successfully treat many ailments, including those listed below.

QUICK RESULTS —No Medicine

Violet Rays work quickly, it's scientific, goes after the cause. That's why results are quick, permanent. Dr. Duncan, Kewanee, Ill. writes, "Violet Rays is the finest thing I ever used . . . to relieve pain, treatments are so pleasant all my patients like it." Use it yourself at home, you save Doctor's bills.

Beauty Aid Brings natural, magnetic beauty of health, no dieting, exercise or drugs. FREE book tells in detail how high priced beauty specialists use it to improve scalp and skin.

EARN CASH

Men, women, without experience earn liberal profits in spare time showing Violet Rays to neighbors. Proves results first demonstration, sells on sight. Get attractive offer and wholesale prices now.

Send For FREE Book

Explains how Nikola Telsa discovered Violet Rays, how it works, why it heals. Tells what doctors and plain folks accomplish in conquering pain, disease and nervous trouble with Violet Rays.

Reveals Marvelous Scientific Discovery Shows charts of human body, explains where pains start, how to banish them. Offered FREE for a limited time only, to introduce Violet Rays. Send for FREE copy.

Check Your Ailment Below for Free Advice

Here is a partial list of ailments successfully treated with Violet Ray:

Catarrh	*Hay Fever*	*Piles*
Chilblains	*Headache*	*Rheumatism*
Colds	*Goitre*	*Skin Diseases*
Constipation	*Insomnia*	*Sore Throat*
Earaches	*Lumbago*	*Sprains*
Eczema	*Nervousness*	*Tonsilitis*
Eye Diseases	*Neuritis*	*Whooping Cough*
Falling Hair	*Paralysis*	*Asthma*

Mail coupon—Send no money

VI-REX ELECTRIC COMPANY,
326 W. Madison Street, Dept. 401 Chicago

Please send me without cost or obligation your free book describing your VI-REX Violet Ray outfits, and details of your $1.00 offer.

Name _____

Address _____

City _____ *State* _____

Dr. Hackensaw's Secrets

(*Continued from page* 910)

believer in the conservation of natural resources. It has taken Nature millions of years to store up her supplies of coal and petroleum, and there is no hope of them being renewed. It seems a wanton waste to use these up for pleasure trips in automobiles. We ought to make use of alcohol or air or water-power or some other such inexhaustible source of energy, instead of consuming these invaluable natural hydrocarbons. My only consolation is that chemistry is making such rapid strides at the present day, that the time is bound to come when we can make the petroleum products synthetically, 'from carbon dioxide and water.'"

Have you had a coal mine here?"

"Yes, and a very rich one. We are working it now. As soon as I perfect my devices for burning the coal without smoke, I shall generate all my own power here and shall then send electrical power by cable to England. 'Turn about is fair play.' Up to date, I have placed the coal, as mined, in large buoyant steel vessels, hermetically closed, allowed them to float to the surface and then towed them to some convenient spot where the water is smooth where the coal can be transferred to ships."

"Your city ought to be useful as a submarine base in war time," suggested Silas.

"Yes, indeed, especially as its existence is not suspected."

"I don't see how you can keep it secret."

"All my help are under contract to remain here five years. Only those I know I can trust are allowed to attend getting supplies and provisions. Of course, Submarina could, in a pinch, furnish all her own food; as fish, oysters and seaweeds of many kinds abound. But I find it easier to import meat, flour, and vegetables rather than attempt to raise them here."

"How could you raise wheat here, without sunlight?"

THE MUSEUM

"I think it could be done by means of artificial light, but until I manufacture my own electricity I shall not do any experimenting in this line. But here we are at the Museum. Come in with me and I'll show you some of the curiosities we have discovered in the ocean's depths. Here are perfect specimens of all kinds of marine plants and animals, specimens such as you will not find in any museum on earth, for my men go out in diving suits and select only the finest specimens. My workers are free to move about as they use my artificial gills to furnish them air for breathing. Then here are relics from sunken ships. These coins and jewels came from a Roman galley that sank here hundreds of years ago, and was deeply imbedded in the silt. We come across very curious things here."

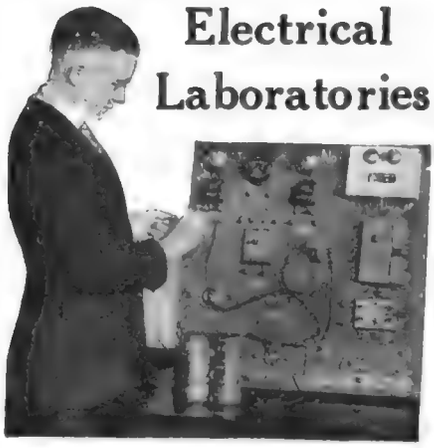
The journey was continued and Silas was shown one new marvel after another. Nothing that might lend to comfort or recreation of the inhabitant was neglected.

The pair stopped at a restaurant and had an excellent dinner, and then took rooms in the hotel—for a hotel had been found a convenience for many, especially those engaged in the transportation of supplies. But, in the middle of the night, Silas Rockett was awakened by the loud ringing of an alarm. An instant later, Doctor Hackensaw, in his nightshirt, was at the door.

"Grab your clothes, quick!" he cried, "and come with me! Submarina has sprung a leak!"

(*Continued on page* 914)

FREE $500.00 Electrical Laboratories



9 Laboratories Sent to Your Home

Real actual-size, expensive units of electrical apparatus are mailed to you without extra charge while learning. The illustration shows one of the 9 new home-laboratory outfits. As fast as you have completed the work of one laboratory, another is sent, until you have mastered the entire field. You, therefore, advance step by step, from simple electrical experiments to complicated, intricate, important practical work.

Learn Electricity this New Quick Way

You can get the finest electrical training at home in your spare time. You need not leave your job, your friends, your home. This wonderful new home-laboratory training course in Practical Electricity brings this great, big technical school to your very door—into your very room. It develops ability, step by step, and leads you to every reward the great field of electricity can offer.

Just Like Going to School

Our large faculty of experts offer you a short cut that combines theory and practice, eliminating all the non-essentials. The plan is so simple—so logical—so carefully arranged, and also so interesting, that in a surprisingly short time you will have made yourself a master of technical electricity.

Earn Big Pay

Billions of dollars are invested in this great industry. Trained experts are in demand and handsome salaries are paid. You can easily master the work through our personal coaching and "home-laboratory" plan so that you can step immediately into the industrial field. **WE ASSIST ALL OUR GRADUATES TO POSITIONS WITH THE LEADING ELECTRICAL FIRMS IN THE UNITED STATES.**

Free—Electrical Apparatus

In addition to the free use of our 9 large electrical experimental boards we will give you all materials and apparatus needed for experimental work with the 9 outfits, **absolutely free** and ship it with the first laboratory shipment. No materials to be purchased by you. We furnish everything needed.

EXTENSION-DIVISION

SCHOOL of ENGINEERING of Milwaukee

415 Marshall Street **Milwaukee, Wis.**

Extension-Division,
School of Engineering,
Dept. S&I-H.124, 415 Marshall St., Milwaukee, Wis.

Please send me "**The Short-Cut to the Electrical Profession**" (just off the press) and full details of your "**new wonderful laboratory method**" of home-study in Practical Electricity. This request obligates me in no way.

Name .....

Address .....

Town ..... **State** .....

Digitized by Google Original from UNIVERSITY OF CHICAGO

HOW I SAVED MY HAIR!

THE TRAGEDY OF BALDNESS

By ALBERT WOODRUFF

WHEN the barber told me my hair was getting thin I merely smiled and let it go at that. When my wife said, "Bert, I do believe you are becoming bald," I gave a little laugh and passed it off with a jesting remark. I took the gibes of my friends in the same spirit—and I laughed when the comedian at the theatre made his "cracks" about candidates for the "bald-headed row."

But it wasn't until my business associates commenced to notice that I was rapidly becoming bald and gray that I worried. For while I was just as full of pep and vim as I had ever been—while my business judgment was just as keen as ever, yet I worried for fear my associates might think of me as heading toward the "has been" class. I decided to try to save my hair—if it could be saved.

Then I became a slave to hair tonics. If a tonic was new I bought it on sight. I tried every kind of shampoo that I heard of. I was a victim of the barber's wiles. The money I spent—and all to no purpose. My hair continued to come out just as fast as it ever did before I had tried to stop it. Every time I combed my hair it told the story.

How I Prevented Baldness

One day I read a very interesting advertisement by the celebrated Physical Culturist, Bernarr Macfadden. Now, it so happened that I had seen Mr. Macfadden several times and I knew that he himself had wonderful thick hair. Naturally I was interested—although it was news to me that Mr. Macfadden had made a study of the hair and had written a book on the subject, entitled, "Hair Culture."

In the advertisement Mr. Macfadden said he was amazed to learn how little really authoritative information had been written about the proper care of the hair and scalp. He said that one need not let the hair grow thin and gray. He said that if the hair is falling out or getting gray a reasonable amount of proper care will restore it, unless one is completely bald. And this same care will keep the hair strong and healthy throughout life. He spoke of simple, natural and effective methods for treating the hair and scalp by following a few laws of nature. Then he casually mentioned that he was startled at the tremendous demand that existed for his comprehensive work. In fact, the first edition of his treatise was very quickly sold and a new edition had to be printed to take care of the orders that were flooding in on each mail.

I made up my mind right then that since Mr. Macfadden had written the book it was sure to be very practical—and the fact that so many had been sold clearly proved to me that the treatise must be filling a popular demand.

So I just jotted my name and address down on the coupon and returned it.

"Only a short while ago my hair was falling out by combfuls, yet today I have fine, thick hair, with not the slightest trace of baldness or dandruff."

Women! Keep Your Hair Youthful

If your hair is graying prematurely you have every reason to hope that it can be stopped and that much can be done toward restoring it to its original youthful and becoming color.

If it is losing its luxuriant quality and glossy sheen the few simple rules taught by Bernarr Macfadden in his new book HAIR CULTURE will enable you to bring about an almost unbelievable improvement. Why spend time and money at the hair dresser's when you can give your hair a better home treatment in only a few minutes a day by this new method? You can easily have hair that is wonderfully silky in texture and your scalp be cleansed of every trace of dandruff or scurf.

When I received the book on five days' free examination I immediately read it very carefully and that very same night I started to follow the few simple rules. I must confess that within a very short time I noticed a decided improvement in the growth of my hair—it became thicker and more glossy. Then dandruff disappeared. Today, after following the rules laid down in this new method, I have just as fine a head of thick hair as you would see on any man—even a young man of eighteen or twenty has no thicker or glossier hair than mine. In fact, many haven't anywhere near such fine hair. The grayness has all disappeared and my hair has the glowing color of youth. My wife and children also adopted the rules which we discovered in Mr. Macfadden's treatise entitled "Hair Culture" and their hair is the admiration of all their friends. If you will examine the book I am quite sure that you will agree with me that it is one of the most valuable—if not the most valuable—and instructive books ever written on Hair Culture.

Albert Woodruff.

Bernarr Macfadden's Secrets of Hair Culture

These chapter titles will give you an idea of the scope and value of this remarkable book:

BERNARR MACFADDEN. Note his thick, luxuriant, healthy hair.

Hair as an attribute to beauty.
Facts everyone should know about hair.
Care of healthy hair.
How to care for baby's scalp.
Facts about soaps and shampoos.
The cause of hair troubles
Dandruff.
Dry Hair, Oily Hair, Split Hair.
Falling hair.
Baldness.
Gray hair.
Hair Dressing.
Eyebrows and Eyelashes.
Superfluous hair.
Hair Tonics.

Send No Money

If you would like to take Mr. Woodruff's advice we will gladly let you examine "Hair Culture" for yourself, without obligation, and see how easily you can follow the methods that should bring new life, new lustre and luxuriance to your hair. Don't send one cent in advance—just fill in and return the coupon and the book will come to you by return mail. When the postman hands it to you, deposit only $2.00 with him. Then after you have kept "Hair Culture" for 5 days—after you have tested the methods—if you are not absolutely satisfied return the book to us and your money will be promptly refunded. If, however, you decide to keep this remarkable book, as you surely will, there are no further payments of any kind to be made—the book becomes your property for the one sum of $2.00 which you deposited with the postman.

MACFADDEN PUBLICATIONS, INC.
Dept. SI-1, Macfadden Building
1926 Broadway, New York City

MACFADDEN PUBLICATIONS, INC.
Dept. SI-1, Macfadden Building
1926 Broadway, New York City

Without obligation on my part, please send me a copy of Bernarr Macfadden's Book giving me all of Nature's simple methods for preserving and beautifying the hair. I will pay the postman $2.00 on arrival, but I also have the privilege of returning the book if I desire and you will refund my deposit.

Name .....

Address .....

.....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Easy to Play Easy to Pay

Donald Clark, Soloist with the famous
Paul Whiteman's Orchestra
Victor Records by Paul Whiteman and his Orchestra are all played with Buescher Instruments.

(16)

Sax Invented, Buescher Perfected the Saxophone

BUESCHER

True-Tone Saxophone

The Buescher Saxophone is so perfected and simplified that it is the easiest of all musical instruments to learn. It is the one instrument that everyone can play—and it wholly satisfies that craving everybody has to personally produce music.
With the aid of the first three lessons, which are sent free (upon request) with each new Saxophone, the scale can be mastered in an hour; in a few weeks you can be playing popular music. Practice is a pleasure because you learn so quickly. You can take your place in a band within 90 days, if you so desire.
For Bands and Orchestras, for church, lodge and school musical affairs, for social and home entertainment, the Saxophone is the most popular instrument and one of the most beautiful. A good Saxophone player is always popular socially and enjoys many opportunities to earn money. Saxophone players are always in demand for dance orchestras. Every town should have a Saxophone quartette or orchestra.

Try It In Your Own Home

You may order any Buescher Saxophone, Cornet, Trumpet, Trombone or other Band or Orchestral Instrument and try it six days in your own home, without obligation. Easy terms of payment may be arranged if preferred. Mention the instrument interested in and a complete catalog will be mailed free.

Buescher-Grand Trumpet

Especially easy to blow, with an improved bore and new proportions. With the mute in, it blows so softly and sweetly that practice never annoys. A splendid home instrument.

Free Saxophone Book

We have prepared a very interesting book on the history and development of the Saxophone. It tells which saxophone takes violin, cello and bass parts and many other things you would like to know. Also illustrates first lesson. Every music lover should have a copy. It is sent free on request. Just send your name for a copy.

BUESCHER BAND INSTRUMENT CO.
Everything in Band and Orchestra Instruments
6016 Buescher Block, Elkhart, Indiana

Buescher Band Instrument Co.,
6016 Buescher Block, Elkhart, Ind.

Gentlemen:
I am interested in the instrument checked below:
Saxophone.... Cornet.... Trombone.... Trumpet....
(Mention any other instrument interested in)

Name .....
Street Address .....
Town .. State.....

Dr. Hackensaw's Secrets

(*Continued from page* 912)

Silas Rockett lost no time. He made one grab for his clothing and then followed the doctor out into the street where they found numbers of lightly clad men, women and children splashing through a small stream of water that had suddenly made its appearance. Among the number was a woman with a baby in her arms—the first child born in Submarina.

"Follow the water!" cried the doctor, and Silas obeyed. He realized only too well what had happened. The enormous pressure exerted by the ocean above, had caused the earth, that formed the roof of the city, to cave in at some spot, and it was evidently but a matter of minutes before the flying people would all be drowned like rats in a trap.

"Good bye, doctor," cried Silas, but the doctor did not hear him. Meanwhile the stream had rapidly risen and the water now reached their knees.

"Grab a life preserver!" cried the doctor.

Silas now noticed that life preservers in large numbers were hanging within reach, on the sides of the houses. Evidently an emergency like the present one had been foreseen and prepared for, and the reporter's spirits rose. The fleeing crowd were all busily engaged in putting on their life preservers, and Silas and the doctor were not a moment too soon in adjusting theirs. Evidently a new portion of the roof had given way, for the water came pouring in, and the stream became so rapid, they were borne along at a terrific pace.

TO SAFETY

"Put on your helmet!" commanded the doctor.

To each life preserver a helmet containing a reservoir of compressed air was fastened. Provision had of course been made so that the air would be reduced to normal atmospheric pressure before being inhaled.

Silas lost no time in adjusting his headpiece, and, before he got it on, he realized the need of this protection, for the air in the street, compressed by the inflowing water, attained a pressure which made breathing difficult. It is a sudden change of pressure like this, that in under-water caissons, gives workmen attacks of "the bends."

At this moment a shriek from the woman with the baby called their attention to the fact that the mother burdened with the child had been unable to provide herself with life preservers or helmets. It was only with the greatest difficulty that Silas and the doctor managed to secure helmets for the two, and get the pair safely protected.

By this time the water was so high that everyone was afloat, borne rapidly forward by the swift current. Luckily their journey was nearly finished, for they came suddenly to the end of the passage where about a thousand persons were floating about, awaiting their turn to pass through a revolving door somewhat similar to those used in department stores.

The purpose of these doors was soon evident. Doctor Hackensaw, in planning Submarina, had foreseen the possibility of a catastrophe like the present one, and had built his city in water-tight compartments, like our modern trans-Atlantic liners. The ocean might burst its way into one of these compartments, but the inhabitants could take refuge in the others.

Communication between the compartments was made by means of revolving doors. On each side of the door was a completely en-

(*Continued on page* 916)

Novelty

Musical Instruments
Not toys—but high-grade practical instruments for Symphony or Jazz orchestras. Great for solo work at Club, Lodge or Legion gatherings or home entertainments. Anyone can play with a few simple lessons, furnished with each instrument.

Musical Pitch Fork | Glassaphone | Jazz-O-Nette
Mando-Zi Harp | Musical Saw | Hohner Sax

Free Trial Try any of these instruments for 15 days. If not satisfied, if you can't learn to play it quickly and easily, return at our expense. Remarkably low prices. Easy Time Payments. Send today for new, illustrated catalog describing complete line.

MUSSEHL & WESTPHAL
468 S. Water Street Ft. Atkinson, Wis.

WHAT KIND OF A MAN ARE YOU?

Lionel Strongfort Perfect Man

Are you strong, healthy, vigorous, filled with pep and vitality? Or are you weak, thin, nervous—an apology for a *real* man—afflicted with Constipation, Indigestion, Vital Depletion, or other ills caused by bodily neglect and abuse?

No matter what your condition, or what caused it, you can revive your flagging powers, and gain perfect Health, Strength and Vitality. I guarantee it. I have helped thousands. I can help YOU. Send for my great FREE BOOK, *"Promotion and Conservation of Health, Strength and Mental Energy."* It's a man-builder and a life-saver. Send ten cents to cover postage.

LIONEL STRONGFORT
Physical and Health Specialist
Dept. 1318, Newark, New Jersey

New ¼ H. P. 110 Volt Guaranteed Motors

Complete with Cord, Plug and Pulley

ONE YEAR GUARANTEE

60 cycle A.C. 1740 speed	$13.00
60 cycle A.C. 1160 speed	16.50
25 cycle A.C. 1450 speed	16.50
Direct current 1740 speed	17.25
Direct current 1160 speed	19.75

All makes and sizes up to 100 h.p. both new and rebuilt. Motors bought, repaired, exchanged. Let us quote on your needs.

Satisfaction guaranteed or money refunded
Illustrated Catalog of Motors and Supplies FREE
HYRE ELECTRIC CO.
631-X So. Dearborn St., Chicago, Ill.

FREE Confidential Reports of Secret Service Operator No. 38

See how great detectives work. More thrilling than fiction. Sent free to ambitious men to arouse interest in this great line of work, so much in need of able trained men. Shows how Finger Print identification plays a vital part in the work of expert investigators. Write today — no charge.
UNIVERSITY OF APPLIED SCIENCE
1920 Sunnyside Avenue, Dept. 53-31 Chicago, Ill.

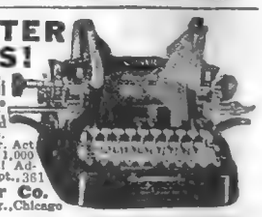
RANGER $5 a Month

Finest bicycle built—44 styles, colors and sizes. Factory to Rider prices. FREE delivery, express prepaid on 30 Days Free Trial. Cash or easy pay'ts.

TIRES lamps, wheels and equipment at half usual prices. Send no money. Write today for big catalog, special Factory Prices, free trial plan and marvelous offers.

MEAD CYCLE CO. Dept. A-107 CHICAGO

TYPEWRITER BARGAINS!



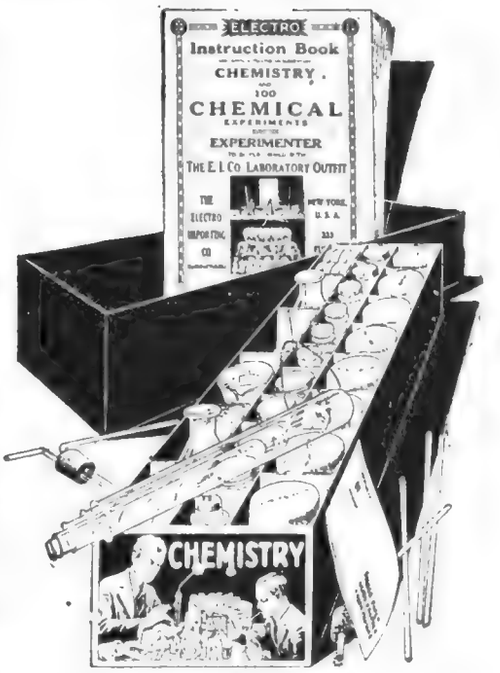
A real writing machine, standard keyboard, all improvements, rebuilt like new in Oliver's own factory, for a *fraction* of what you'd expect to pay! Easy terms.
Send now for new offer. Act quick, and get yours from 1,000 machines just put through! Address—Rebuilt Machine Dept., 361
Oliver Typewriter Co.
159 Oliver Typewriter Bldg., Chicago

WHY NOT IMPROVE YOUR PERSONAL APPEARANCE.
Send for booklet showing photos of Men with and without the (PERFECT LEG FORMS) for BOW LEGS and KNOCK-KNEES. Also BRACES, for children for PERMANENT CURE.
Perfect Sales Co., 140 N. Mayfield Ave., Dept. 50 Chicago, Ill.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

A Chemistry Laboratory for $7.00

Think of it, fellows! Here is a *real* chemistry outfit with regular chemical apparatus that performs those fascinating, actual chemical experiments. This outfit is not a toy, put up merely to amuse, but a practical laboratory set, with all the chemicals, apparata and reagents necessary to perform real work and to teach the beginner all the secrets of inorganic chemistry.



DESCRIPTION OF THE OUTFIT

The outfit consists of 44 Chemicals and Reagents all C. P. put up in appropriate wooden boxes, glass bottles, and hermetically closed jars. The acids are put up in glass bottles with ground-in glass stoppers, and there is a sufficient quantity of chemicals supplied (mostly one to two ounces) to make dozens of experiments with each.

The apparatus furnished are all of the best obtainable make and of standard laboratory size and shape.

The Instruction Book is a real Chemistry Course for the Beginner. Some of the Contents are: **Division of Matter:** This is a Treatise on Elementary Chemistry and deals with the theory of the Elements, Molecules and Atoms, etc. **Chemical Nomenclature:** This explains in simple language the derivation of the chemical names of the elements and their compounds. There is a chapter on **Laboratory Operations; Glass Working; First Aid; Fire Extinguishers; Experimenters' Aphorisms,** etc.

A good part of the book is devoted to **Weights and Measures.** The Metric System, The English System and the U. S. System are fully explained.

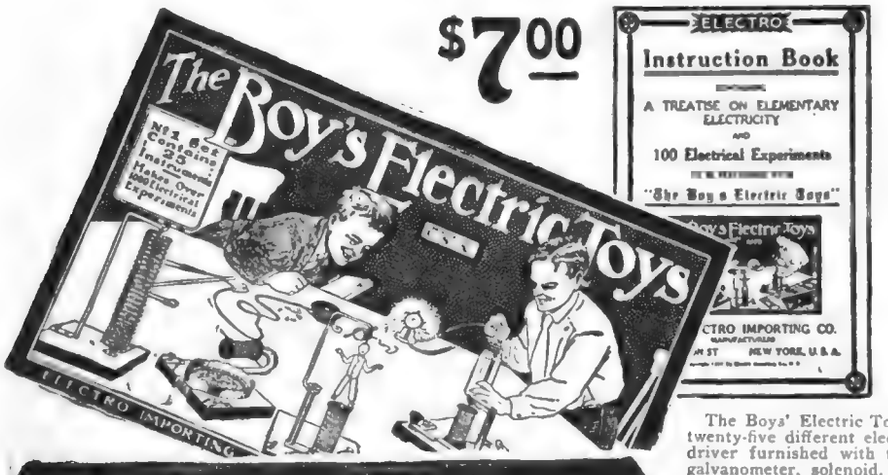
The following tables are furnished: Symbols and Atomic weights of the Elements; Measures of Weights, Volume, Capacity and Length; per cent solutions; Conversion of Measure expressed in parts; poisons and their antidotes; technical and common name of chemical substances; formulas for cleaning various substances, etc., etc.

Among the 100 Experiments are:

How to make chemical tricks; How to make invisible and magic inks; How to test flour; How to test soil; How to make chlorine gas and smoke (German War Gas); How to bleach cloth and flowers. How to produce Oxygen and Hydrogen; How to make chemical colors; How to test Acids and Alkalies and hundreds of interesting hints and formulas.

Complete, $7.00 Sh. Wght, 10 lbs. (Shipped by Express only)

(We guarantee shipment within 24 hours after your order is received.)



Every Fellow Wants the

BOY'S ELECTRIC TOYS

The Boys' Electric Toy contains: Enough material to make and complete over twenty-five different electrical apparatus without any other tools except a screwdriver furnished with the outfit. Student's chromic plunge battery, compass-galvanometer, solenoid, telephone receiver, electric lamp, etc. Enough various parts, wire, etc., are furnished to make the following apparatus:

Electromagnet, electric cannon, magnetic pictures, dancing spiral, electric hammer, galvanometer, voltmeter, hook for telephone receiver, condenser, sensitive microphone, short distance wireless telephone, test storage battery, shocking coil, complete telegraph set, electric riveting machine, electric buzzer, dancing fishes, singing telephones, mysterious dancing man, electric jumping jack, magnetic geometric figures, rheostat, erratic pendulum, electric butterfly, thermo-electric motor, visual telegraph, etc., etc.

With the instruction book we furnish one hundred experiments that can be made with this outfit, nearly all of these being illustrated with superb illustrations. No other materials, goods or supplies are necessary.

The outfit contains 114 separate pieces of material and 24 pieces of finished articles ready to use at once.

The size over all of the outfit is 14 x 9 x 2¾. Shipping weight, 8 pounds.

"The Boy's Electric Toys" outfit as described, $7.00

Immediate shipment.

SEND NO MONEY

We have so much confidence in these sets that we desire to ship either one to you by express C.O.D. with the privilege of inspection. In other words, we ship on approval. It does not cost you one cent to take a good look at whichever outfit you want, and see if it comes up to your expectations. If it does, pay the express man $7.00, plus express charges. If not, you need not accept it, and we will pay the return charges as well.

ELECTRO IMPORTING CO., 233 Fulton Street, New York City

ELECTRO IMPORTING CO.,
233 Fulton St., New York

Please send me by express THE CHEMICAL LABORATORY. If I don't like it I need not accept it. If I want it I only pay $7.00 plus the few cents express charge.

.....

.....

.....

S & I -1-24

ELECTRO IMPORTING CO.,
233 Fulton St., New York

Please send me by express THE BOY'S ELECTRIC TOYS. If I don't like it I need not accept it. If I want it I only pay $7.00 plus the few cents express charge.

.....

.....

.....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

How This Man Won Success

As an Electrical Expert

General Manager of his company at 28 years of age! His own boss—owns his home—married and happy and prosperous—that's the remarkable success achieved by Wallace H. Rohrschneider, now General Manager, Secretary and Treasurer of the Hustisford Light, Power and Manufacturing Company of Hustisford, Wisconsin.

Mr. Rohrschneider got his start toward his quick and brilliant success at School of Engineering of Milwaukee. There he received the practical, intensive and specialized training that enabled him to make good in a big way.

Why Don't You Get Into This Big Pay Field?

The same kind of training that put Mr. Rohrschneider into the ranks of the highly-paid Electrical Specialists will qualify you for brilliant success in this fascinating field of unlimited opportunities. Come to America's Greatest Institution of Electrical Education. Learn by actual practice in our big laboratories with their magnificent equipment, including motors, dynamos, switchboards, ignition and lighting systems, etc. Recognized experts give you personal instruction every step of the way.

Earn Your Way Through This Great College

You can earn money to help defray your expenses while you are learning. Our wonderful co-operative plan brings an Electrical Career within the reach of every ambitious man. Our Free Employment Department secures positions for those students who wish to earn part or all of their expenses. In addition, the Department will help you get a good position in the Electrical industry when your training is completed.

BIG BOOK FREE—Mail the coupon today for our big new illustrated catalog. Check the course that interests you most and we will send you special information. Read about the School that trains men for practical and quick success. See how easy it is for you to get the training that will enable you to step to a splendid position and a handsome income. Mail the coupon right NOW. No cost or obligation.

SCHOOL of ENGINEERING of Milwaukee

Dept. S.&I.-124, 415 Marshall Street, Milwaukee, Wis.

MAIL COUPON NOW

SCHOOL OF ENGINEERING OF MILWAUKEE
Dept. S.&I.-124, 415 Marshall St., Milwaukee, Wis.

Please send me without any cost or obligation, full particulars of the electrical course I have checked and your big Free Book telling about your institution and how it will fit me for a big position in the electrical field. Also tell me about your Earn-While-You-Learn plan.

(Check courses interested in, and be sure to give your education.)

—School of Practical Electricity—6 months or 1 year course. Complete general course, covering entire electrical field.
—Institute of Electrotechnics—12 to 30 months' course. Practical electrical training combined with thorough Academic education.
—College of Electrical Engineering—3 years' course. Regular collegiate work granting B. S. Degree. 14 High School units or diploma from our Institute of Electrotechnics required for entrance.
—Commercial Electrical Engineering—1 year course. Thousands of Trained Men wanted in this new profession. 14 High School units or diploma from our Institute of Electrotechnics required for entrance.
—School of Automotive Electricity—3 to 6 months. Covers all systems of starting, lighting, ignition, and storage batteries for automobiles, tractors, air-craft, etc. Intensive practical course.
—Armature Winding and Motor Generator Repair Course—3 to 6 months' course. Brief, but intensely practical, leading to well-paying positions.
—Electrical Home-Service Training with laboratory facilities, for those who cannot come to Milwaukee.

Name .....

Street .....

City ..... State.....

Age ..... Education.....

Dr. Hackensaw's Secrets

(*Continued from page* 914)

closed platform hermetically tight, which held one hundred persons. Revolving this platform half way, brought it safely to the next unflooded portion of the city—the small amount of water in which the persons floated was of course carried with them, but was of no consequence.

While Silas and the doctor were waiting for their turn to pass through the door, the doctor showed the reporter an iron grating through which the ocean water was descending into an unused mine-shaft.

"You see," he explained, "I constructed my door here, in order that the current of water, flowing down into this shaft, should carry all refugees safely to this spot—the only place where safety lies."

Silas admired the ingenuity of the scheme, but he was shivering with the cold and glad to get somewhere where he could obtain dry clothing. But he had had enough of submarine cities, and when the doctor suggested returning to London, he acquiesced with alacrity.

"Submarine cities are very interesting," said he, "and they offer some novel experiences, but as for me, give me the sunlight and the open air!"

Correct Postures for Various Workers

The ill effects caused by the strain on workers who are forced to hold one position for hour on hour, on account of the nature of their work or of the machine they operate has long been known. The U. S. Department of Health is conducting a campaign for the relief of this condition. In their circular letter "DBF," some of the most harmful of the positions are illustrated and remedies suggested. At the left is shown one of the most harmful. The woman at the machine is forced to stand with one side of her body contracted and the other expanded.

When workers are forced to sit on chairs too high to admit the feet touching the floor, a foot-rest on the order of the one shown above should be provided. If it is not, fatigue will result.

(*Continued on page* 928)

The Heavens in January

BY ISABEL M. LEWIS, M. A.

(*Continued from page* 878)

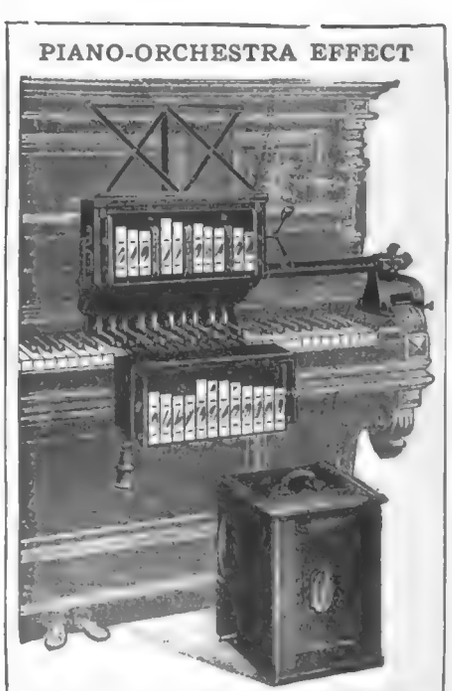
ual Orion or "helium" type as its bluish-white light indicates. The three evenly spaced stars that mark the Belt of Orion and the two stars Saiph and Bellatrix that form, with Betelgeuse and Rigel, the huge quadilateral that outline the body of Orion are all second-magnitude stars. No other constellation contains so many brilliant stars or so many objects of exceptional interest. Most of the brightest stars in the group are either double or multiple stars and the possessor of a small telescope will find this a rich field to explore. The line of faint stars to the west of the quadrilateral represents the lion's skin that is flung over the left shoulder of Orion while the line of faint stars running northward from Betelgeuse and then turning sharply to the westward represents the uplifted arm of Orion and the club that he is brandishing. Its tip lies close to the horns of Taurus. Betelgeuse which is Arabic for armpit, is the star in the right shoulder of Orion.

It was the first star to be measured with the Michelson interferometer and its diameter is about two hundred and seventy-five times that of the sun. As to its distance from the earth there is some uncertainty but it is probably between one hundred and fifty and two hundred light years. In addition to its interest as a giant star, Betelgeuse is an irregularly variable star by as much as half a magnitude The cause of its light variations are so far unexplained.

Close at the heels of Orion follow the two dogs, Canis Major and Canis Minor. Sirius, the brightest star in the heavens and one of the nearest stars—only eight and three-fourths light years away—is the principal star in Canis Major.

Venus is now a beautiful object in the west at sunset but sets about two hours after the sun. It is gradually approaching the earth and is slowly increasing in brightness. Mars, Jupiter and Saturn will all be found in the eastern sky before sunrise. It will be spring before they will be seen in the evening hours.

PIANO-ORCHESTRA EFFECT



New German piano with orchestra effect for individual playing; includes bells, xylophone, cymbal and chimes.

Digitized by Google

Original from UNIVERSITY OF CHICAGO

The Month's Books

A digest of the general scientific publications issued during that period, with brief criticism.

THE OUTLINE OF SCIENCE. In four volumes. By J. Arthur Thompson. 1220 pages, profusely illustrated. Board. G. P. Putman's Sons, New York.

It would be one of the most profitable steps ever taken in education if the plan of the book—and the book itself, for that matter—were made a compulsory study in every college course. The first chapters of the work are given over to a brief survey of the universe and how the earth came into existence. Then follows a discusson of the theory of evolution and the ascent of man over the mammals and reptiles. Being written in the paragraphed form, it is very easily understood and the continuity of the discusson and the presentation of facts is clear and concise.

The process of evolution is thoroughly discussed; all phases of it are covered in a very understandable way. The first volume closes with a chapter on "The Foundation of the Universe," which opens with the story and theories of the atom. This chapter sets out the latest accepted ideas concerning the atom and the neucleus and electron theory of its construction.

The second volume takes up the body in its anatomical evolution.

Natural history under the headings of birds, mammals and insects is then discussed in outline. The outline form of the treatise gives the reader a clear understanding of the relations of the various forms of life to one another.

The second volume closes with a discusson of the workings of the mind—psychology. Its completeness is indicated by the fact that the Freudian theory is discussed.

Following this, at the beginning of the third volume, comes a chapter under the name of Sir Oliver Lodge on "Psychic Science," in which the famous Englishman presents his views. The facts are merely presented, the reader is asked to take nothing for granted. He may take it or leave it, according to his own opinion.

Then follows Botany and a very interesting discussion on the inter-relation of living creatures, biology, and a brief discussion of chemistry and electricity.

The fourth volume is more specialized in its scope, taking up the domestication of animals, the seasons, and the causes and signs of "weather." There is also a chapter on the Einstein Theory.

The work is printed in large type and its profuse illustrations lead to ease of assimilation of ideas, some of which may be new to the reader. The fact that it takes up the science of the world in its logical order and inter-relates all branches of it, makes it very valuable. Everyone interested in science should read it, if, for no other reason, than because it will help greatly to classify the maze of information he may collect on scientific subjects. It will organize his knowledge.

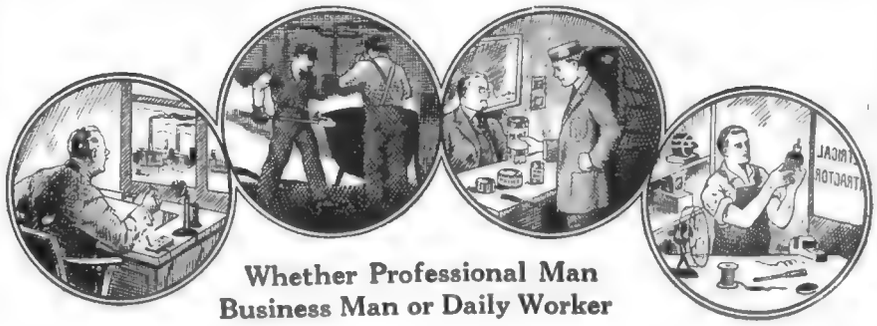
THE GLANDS REGULATING PERSONALITY. By Louis Berman, M. D., Associate in Biological Chemistry, Columbia Universty. Cloth. 300 pages. The MacMillan Co., N. Y.

Although a great deal that is bizarre and a lot more that is idiotic has been said about the glands of internal secretion, lately, in connecton with the so-called youth restoring operations, there is nothing but close scientific discussion in this book. There is a short introduction on the general attitude toward human nature leading to a discussion of how the glands affect it. A short history of the discovery of the ductless glands follows and the research finally leading to the discovery of their important relation to the formation of character is described.

The thyroid and pituitary glands (the two most important of the ductless glands) are discussed. Here the situation, fluid of secretion, and their place in the scheme of evolution are commented upon. In each case, data, experiments and theory concerning them are set down in the manner of a scientist. There is nothing of the florid journalistic craze about the treatment of the subject.

Finally, toward the latter part of the book, a great many of the characters of history are discussed in relation to their glandular equipment—a new light in which to analyze the brilliant men of the world, possibly, but one that explains them quite thoroughly and accounts for many of their shortcomings and failures that otherwise have to be credited to "human nature."

No Matter What Your Vocation



Whether Professional Man
Business Man or Daily Worker

A Thorough Training In

CHEMISTRY

Will Help You To Get Ahead

TO be successful today is to know Chemistry! Every line of business, every branch of industry depends upon Chemistry in some form. You may not realize it, but your own proficiency in whatever work you are doing would be increased by a knowledge of Chemistry. In many lines such knowledge is absolutely essential. In others it is a guarantee of promotion and more money.

The keen competition that exists in every commercial activity today requires that a man know all there is to know about his vocation. If you have something to sell—no matter what—Chemistry enters into its make-up. The salesman who knows the chemical composition of his article can talk about it more intelligently than the one who lacks this information, and his sales are proportionately larger. In the building trades Chemistry is of prime importance. The mason, electrician or painter who knows something about Chemistry can do better work and command more money than the one who does not. Through Chemistry a shop-keeper learns how to attract the most trade, and even in clerical positions one can capitalize his chemical skill.

Chemistry should be as much a part of your mental equipment as the ability to calculate or to write correct English. The world is paying a thousandfold more for ideas than for actual labor. The big rewards go to the man who can show how to turn out a little better product at a little lower cost. And Chemistry will give you the ideas that will save money for yourself or your firm in the very fundamentals of your business. There is nothing remarkable about this; it is going on every day. If you have not heard of it before, it is because the general public has been slow to recognize the tremendous value of chemical training. People have been content to leave Chemistry in the hands of a few trained chemists who could not possibly develop the subject to anywhere near its greatest extent.

Now we are on the eve of a great awakening. Our heritage from the World War has been an intense development of the chemical industries in the United States and a tremendous interest in all the applications of Chemistry. People are taking up the subject merely for the good it will do them in their own line of business.

It is no longer necessary to enter college in order to learn this fascinating science. Our Home Study Course trains you just as thoroughly, and with the same assurance of success, as those who took the longer way. And our methods are so simple that we can teach you no matter how little previous education you may have had. Many of our graduates now hold responsible positions or have materially increased their incomes from private enterprises as a result of taking our course. Hundreds of letters from students testifying to the benefits they have derived from our training are here for your inspection.

Remember that you do not need to study Chemistry with the idea of actually practicing as a chemist, although a great many of our students are taking our course with this object in view. If you want to know more about what Chemistry will do for you, if you want to know what our home study course offers, sign and mail the coupon today for FREE BOOK "Opportunities for Chemists."

Chemical Institute of New York, Inc.
HOME EXTENSION DIVISION I
66-D West Broadway, New York City

DR. T. O'CONOR SLOANE Will Teach You Chemistry In Your Own Home

The Chemical Institute of New York, of which Dr. T. O'Conor Sloane is Educational Director, was founded to fill the need of ambitious, far-sighted men who realize and recognize the splendid future Chemistry offers them, but who cannot spare either the time or the money to attend college. Dr. Sloane, a foremost authority on Chemistry, will teach you and will give you any individual help you may require. He will personally go over your papers, correct them, point out your faults, teaching you in a practical and interesting way. No special education required other than the ability to read and write English. One student has characterized our lessons as "The course that takes the mystery out of Chemistry."

Read What One of Our Recent Graduates Reports

"I thought I would let you know of my success. I finished your course about two months ago and now have a fine position as chemist at the DuPont Dye Works. I am getting along fine with my work and like it very much. It was through your course alone that I have been so successful. It is wonderful and I hope you have great success with it.

(Name and Address on request).

Easy Monthly Payments

You do not have to have even the small price of the course to start. You can pay for it in small monthly payments—so small that you won't feel them. The cost is very moderate, and includes everything, even the Laboratory Equipment—there are no extras to buy with our course. Our plan of monthly payments places a chemical education within the reach of everyone.

Laboratory Equipment Given To Every Student Without Additional Charge

We give to every student without additional charge his chemical equipment, including forty-two pieces of laboratory apparatus and supplies, and seventeen different chemicals and reagents. These comprise the apparatus and chemicals used for the experimental work of the course.

Special 30-Day Offer

For a short period we are making a special offer that will be worth your while to take advantage of. Write for particulars, using the coupon below or simply a postal card. This will not obligate you in the least. Do not wait until to-morrow. Send the coupon now while you think of it.

Sign and Mail the Coupon for FREE BOOK

CHEMICAL INSTITUTE OF NEW YORK, Inc.
Home Extension Division I,
66-D—West Broadway, New York City.

Please send me at once without any obligation on my part, your Free Book "Opportunities for Chemists," and full particulars about the Laboratory Equipment furnished to every student. Also please tell me about your plan of payment and your special 30 day offer.

NAME .....

ADDRESS .....

CITY .....

STATE .....

S.&I., 1-24

Digitized by Google
Original from UNIVERSITY OF CHICAGO

The Lucky Youth

FORTUNATUS had only to don his enchanted cap and make a wish to obtain anything his heart desired. It is not given to ordinary mortals to have so simple and direct a mode of filling their wants.

But have you ever considered what a boon advertising has become? Everything you need or wish is displayed for your benefit in the advertisements. Manufacturers use advertising to lay before you their most attractive products. You have only to choose at your ease the things you care most about before actually going to see them in the stores.

Advertising is continually making the world better dressed, better fed and better housed. It is increasing the world's capacity for things that elevate, improve and idealize the important business of living. It is a big, vital force in fostering convenient, comfortable and useful lives.

Empty your home of all advertised things and see what a hole you make!

Yes, it pays to read advertising

U. S. Government Needs Men!

Wonderful opportunities in Civil Service. Thousands of men and women appointed every year. Generous salaries, short hours, liberal vacations. Positions open in Washington and in every other city of the country, as well as in Porto Rico, Alaska, Hawaii and the Philippines. Write to-day for 48-page FREE BOOKLET on CIVIL SERVICE, which tells you how you can get a good-paying position with the United States Government.

INTERNATIONAL CORRESPONDENCE SCHOOLS
[illegible], Penna.

Taylor COMPASSES

are best for galvanometers, radio compasses and laboratory experiments. Prices according to style. Each instrument accurate and dependable for a life time. Permanent magnets, either bar or floating dial type.

Send 15c for booklet, "The Compass the Sign Post of the World," illustrating use of compass and has map showing declination for different parts of U. S. Prices and literature on request.

Taylor Instrument Companies
Rochester, N. Y., U. S. A.
C143

FUNDAMENTALS OF RADIO. By J. L. Thomas. 207 pages, illustrated. Board. D. Van Nostrand Co., New York.

Beginning with a chapter that is called "Review of the Principles of Radio," the author explains very tersely, but in terms perfectly understandable to those who have the amateur's knowledge of electricity, the primary laws of radio. Following this, instruments and methods of measurement are taken up. The style of the book is concise and clear throughout, giving the reader the facts unadorned. There is no trouble in understanding the principles set out. Following the chapter on measurements he goes on through the theory of capacity and inductance and then into the principles of transmission and reception of signals. The book is very complete with tables and glossary, making it exceptionally valuable for the young amateur.

RELATIVITY AND MODERN PHYSICS. By George David Birkhoff and Rudolph Ernest Langer. Cloth, 283 pages. Harvard University Press, Cambridge, Mass.

Here we have a mathematical treatise on the relations of the Einstein theory to modern and classical physics. Although the two college professors who are its authors definitely assert in the preface that the minimum of technical matter is used in its presentation, the book, nevertheless, is composed by building one formula on another. The chief work of the book is a postulation of time and space in such a manner as to be a working basis for both the Einsteinian and classical theories.

The latter part of the book is given up to a discussion of various points of the two theories in connection with the problems of gravitation.

FUEL OIL IN INDUSTRY. By Stephen O. Andros. Cloth, 198 pages. Petroleum Extension University, Fort Wyane, Ind.

With the ever increasing vicissitudes that are besetting the coal industry and making the fuel supply for industries, as well as for householders, more and more hazardous, oil as a fuel is coming very much to the fore.

This little book discusses the problems of combustion and shows how commercial needs may be satisfied with oil fuel. Beginning with a sort of elementary treatise on combustion—inserted so the problems treated later in the book may be more thoroughly understood—the author passes on into the field of heavy oil as a fuel. There are chapters on the heat content of oil, the making of tests to ascertain the correct amount of air to be used with it and the correct design of fire-box in which the oil is to be burned.

There are also individual chapters dealing with the specific problems of combustion on railways and in steamships. The most important chapter, by far, to the most of us, is one dealing with the installation of oil burners in the home. This phase of the problem is treated fully and with great care. The ordinances of many cities regarding the storage of fuel oil are almost cruel in some localities. This question is also submitted to discussion.

This is the second edition of the book, rewritten and revised on account of the new factors added to the problem by constant fluctuation and almost ever-present instability of the coal market.

THE TYRANNY OF GOD. By Joseph Lewis. Board, 122 pages. Published by the Truth Publishing Co., New York.

This little volume directed against God and Nature is quite the silliest, inane thing that has come to the attention of this department in months. Not that the reviewer is not open minded to any system of proof. Quite the contrary. Whether the department believes in the statements and conclusions drawn by an author or not, it always respects straight thinking, and that is precisely what this book lacks. There's no thinking in it, at all; it's simply a collection of blind spleen.

For example, this Lewis says (in effect) that if there is a God, as most people say there is, and if this God is like what they say He is, He would not have made the human machine imperfect. Ergo, there is no God. Further, he says that the human race is only slightly removed from the stage of cannibalism because they still eat the flesh of animals.

That is as far as the reviewer read; he then threw the book into the waste-basket and went into the park across the street to let the sunshine and this same nature that Lewis deplores so, keep him from doing murder.

THE EARNING POWER OF RAILROADS. By Floyd W. Mundy. Leather. 442 pages. Jas. H. Oliphant and Co., New York.

This little book of statistics and notes deals with the financial engineering side of the railroad problem. In the financial statements, set out

Digitized by Google Original from UNIVERSITY OF CHICAGO

at the opening of the book, is given the total capitalization, bonded indebtedness, and the yearly earnings, gross and net, of the roads of the United States and Canada. In the notes following the text, there is a large fund of information as to the present organizations, changes that have taken place during the last year, and comments on the general financial condition of the roads.

This volume is the seventeenth annual edition.

BY WIRELESS FROM VENUS, or THE PRIMAL ELEMENTS. By Charles Henry Taylor. Board, 391 pages. The Planet Book Distributers, Los Angeles, Calif.

It is all settled, this question of Spiritualism. "By Wireless from Venus" settles it. In the introduction, the author states that the book is written in fictional form so it can more easily reach the minds of the readers. Why take it as fiction? It settles everything.

The author divides all life into two forces, namely electricity and viticity. The first is well known, the second is the author's great contribution to science. It's the vibration of life, he says, and the motive power of all life. All material things are electricity, all animate things are motivated by viticity, the author's discoveries. Simple, isn't it? He says the alleged phenomena of spiritualism, the work of mediums, spirit writings, and all such, are not miracles at all; says there is nothing mysterious about them, that they are simply the natural workings of the viticity.

But he not only settles the problems of the mind but also the problems of astronomy. The universe, we are told by him, is built around one central star about which all the suns revolve in their orbits and around which, in turn all the planets and their satellites revolve. Quite simple, the universe.

INSECTICIDES AND FUNGICIDES; SPRAYING AND DUSTING EQUIPMENT. A Laboratory Manual with Supplementary Text Material. By O. G. Anderson, Professor of Horticulture, Purdue Universty and F. C. Roth, Instructor in Horticulture, Purdue University. Cloth, 337 pages, illustrated.

This manual offers instruction in preparing insecticides and fungicides as applied to horticultural crops. A detailed study of spraying and dusting equipment is also included, and this subject is treated from the standpoint of those who must use these appliances. Aside from its value as a general reference, that portion of the book which deals with appliances, and their efficient operation, will be of special interest to park superintendents, nurserymen, and county agents. A new treatment of the subject is also offered to those engaged in the manufacture and distribution of spray and dust materials and machinery.

Special ingredients, methods and equipment are discussed, and reasons for a rise or decline in their usefulness are given.

In the interest of the reader, whose knowledge of chemistry is limited, the authors have presented the subject in simple form, using few technical terms.

A series of exercises, requiring the student to work with his hands, as well as with his head, adds to the usefulness of the manual.

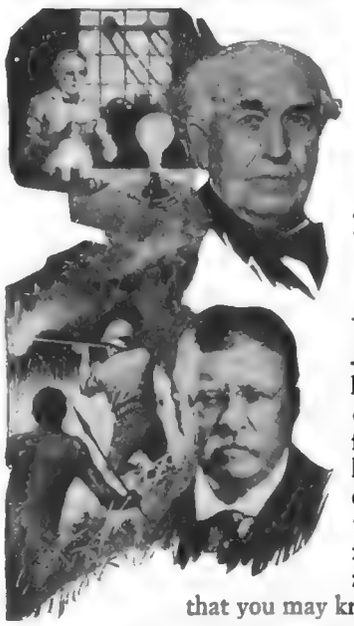
HANDBOOK OF CHEMISTRY AND PHYSICS. By Charles D. Hodgman, M. S., and Norbert A. Lange, Ph.D., size 6¾"x4¼". Flexible cloth covers, 803 pages. Published by Chemical Rubber Publishing Co., Cleveland, Ohio.

This book, now in its ninth edition, has been compiled from the most authentic sources of chemistry and physics and is getting better and better with each successive edition. It gives promise of extending through many more editions, each one being better than the last.

The scope of work which this book covers is so great that no one interested in chemistry, physics, electricity, or in fact science of any kind, can afford to be without it. It covers such topics as mathematical tables, tables of general information, including international atomic weights and various different kinds of solutions. It enters into the various properties of matter giving boiling points, constants of elasticity, co-efficients of friction and all other properties of the various materials used in everyday life and scientific pursuits.

Expansion and contraction due to heat and cold is also dealt with in the form of tables listing almost every substance which the scientist would have to work with, hygrometric and barometric tables are given which become very useful in the study of weather conditions.

Under the chapter entitled "Electricity and Magnetism," tables of all kinds will be found giving sizes of wire with resistances and other characteristics too numerous to mention.



Miracle Men of Science

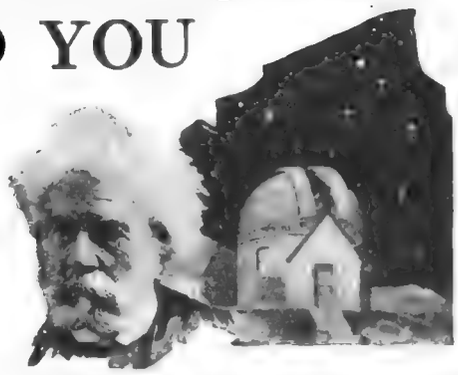
Their Amazing Achievements Told at Last in One Absorbing Story

FOR centuries men of genius have been making wonderful discoveries, have been disclosing the amazing secrets of nature, have been getting her great forces under control. Their achievements have changed our world and transformed our daily lives. The record of their triumphs forms a thrilling romance — a romance which has now been told, for the first time, in one simple flowing story. So that you may know about this epoch-making work we offer

A Striking Booklet

With Over 30 Fascinating Pictures

FREE TO YOU



This profusely illustrated little book, with four color plates and over thirty black and white illustrations of scientific marvels shows how the four magnificent volumes of *The Outline of Science* describe the whole wonder world of science. This fascinating booklet is yours free—send the coupon below—no obligation and no expense.

The Romance of a Thousand Thrills

is *The Outline of Science* and this free booklet, with its amazing illustrations and interesting story, will show you how it tells of all the miracles science has accomplished since the beginning of time—how man has torn the veil from the distant past—how he has read the secrets of the heavens and the deep sea—how he has created instruments that give him unbelievable powers—how he has solved the riddle of life itself. "Should be read by every human being" *says William Beebe, famous scientist.* "More interesting to read than any romance."—*N. Y. Globe.*

Send Now for Your Copy of This Free Booklet

and see why hundreds of authorities are unanimous in praising *The Outline of Science.* The many illustrations in the booklet, taken from *The Outline of Science,* are of unusual value in themselves. And you want to know more about the great work which has been hailed as the most important publishing achievement in many years. Send the coupon now.

G. P. PUTNAM'S SONS, Publishers
Dept. 411, 2 West 45th Street, New York

Send This Coupon

G. P. PUTNAM'S SONS
Dept. 411, 2 West 45th St., New York

Send me by mail, without cost or obligation of any kind on my part, the free booklet with four color plates and over thirty black-and-white illustrations describing *The Outline of Science.*

Name .....

Street and No. .....

City and State .....

Occupation .....

Digitized by Google

Original from UNIVERSITY OF CHICAGO

"Mary, I Owe It All to You"

"MR WILLIAMS called me into his office to-day and told me he was going to raise my salary $50 a month.

"'I am glad to give you this opportunity,' he said, 'for the best reason in the world. You deserve it.

"'You may not know it, but I've been watching your work ever since the International Correspondence Schools wrote me that you had enrolled for a course of home study. Keep it up, young man, and you'll go far. I wish we had more men like you.'

"And to think, Mary, I owe it all to you! I might still be drudging along in the same old job at the same old salary if you hadn't urged me to send in that I. C. S. coupon!"

How about you? Are you always going to work for a small salary? Are you going to waste your natural ability all your life? Or are you going to get ahead in a big way? It all depends on what you do with your spare time.

More than 180,000 men are getting ready for promotion right now in the I. C. S. way. Let us tell you what we are doing for them and what we can do for you.

Mail the Coupon To-day

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6216-C, Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject *before* which I have marked an X:

BUSINESS TRAINING COURSES

☐ Business Management	☐ Salesmanship
☐ Industrial Management	☐ Advertising
☐ Personnel Organization	☐ Better Letters
☐ Traffic Management	☐ Show Card Lettering
☐ Business Law	☐ Stenography and Typing
☐ Banking and Banking Law	☐ Business English
☐ Accountancy (including C.P.A.)	☐ Civil Service
☐ Cost Accounting	☐ Railway Mail Clerk
☐ Bookkeeping	☐ Common School Subjects
☐ Private Secretary	☐ High School Subjects
☐ Spanish ☐ French	☐ Illustrating

TECHNICAL AND INDUSTRIAL COURSES

☐ Electrical Engineering	☐ Architect
☐ Electric Lighting	☐ Blue Print Reading
☐ Mechanical Engineer	☐ Contractor and Builder
☐ Mechanical Draftsman	☐ Architectural Draftsman
☐ Machine Shop Practice	☐ Concrete Builder
☐ Railroad Positions	☐ Structural Engineer
☐ Gas Engine Operating	☐ Chemistry ☐ Pharmacy
☐ Civil Engineer	☐ Automobile Work
☐ Surveying and Mapping	☐ Airplane Engines
☐ Metallurgy ☐ Mining	☐ Agriculture and Poultry
☐ Steam Engineering ☐ Radio	☐ Mathematics

Name.....
Street 8-3-23
Address.....
City..... State.....
Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

MAKE MONEY AT HOME

YOU CAN make $1 to $2 an hour writing show cards at home in your spare time. Quickly and easily learned by our new simple method. No canvassing or soliciting. We show you how, guarantee you work at home no matter where you live and pay you cash each week. Full particulars and booklet free. Write to-day.
AMERICAN SHOW CARD SYSTEM LTD.
Authorized and Fully Paid Capital, $1,000,000
110 Adams Bldg. Toronto, Canada

5 Master Keys

Work like magic in emergencies or prove whether your ... or padlocks are burglar-proof. Or ... st thousands of different locks ... users in ten different ... derful and only ... $1 today. Novel key ...
M... st Water St., Milwaukee, Wis.

Light is also dealt with in a very comprehensive manner and under the chapter on Miscellaneous Tables are found such things as Röntgen Rays, Meteorological Data, Acceleration of Falling Bodies, etc. Two chapters are devoted to Formulas, one to Laboratory Receipts and the other to Photographic Formulae.

By means of a very complete table of contents and index it is possible to locate very quickly any desired subject in the book.

THE FACE OF THE EARTH AS SEEN FROM THE AIR. By Willis T. Lee. Illustrated, 110 pages. Hard cloth covers, size 10"x7". Published by American Geographical Society, New York City.

Within the covers of this book is found one of the most complete collections of aerial photographs ever gathered together in one volume. The book is printed on coated stock which lends itself very well to the reproduction of the various photographs. The pictures are by far the outstanding feature of the work and as an introduction, the first photograph in the book is one of the National Capitol, at Washington, D. C., taken from the air. The details in the photographs are marvelous and the methods of taking the various ones used for illustrations are thoroughly covered. Composite photographs are also dealt with and the relationship between landscape-gardening and aerial photography is well put forth. A further chapter deals with the making of maps from aerial photographs and the value of such pictures is well put forth. Maps of portions of mud flats inaccessable to surveyors are shown.

To anyone interested in photography of any kind or in map making and general geology work, this volume is of inestimable value.

500 QUESTIONS AND ANSWERS TO STEAM HEATING. By Alfred G. King. Illustrated, 253 pages. Hard cloth covers, size 9"x6". Published by The Norman W. Henley Publishing Company, New York City.

This book in a thoroughly revised and enlarged second edition has been arranged for the use of all engaged in the business of steam, hot water heating and ventilation. It is well illustrated throughout and the text is arranged in a question and answer form, making reference to various parts exceedingly easy. A table of contents and an index records everything contained in the book and assists in locating various subjects. "Tricks of the Trade" for shop use and of general usefulness to anyone engaged in this business are given in a simple and concise form and the reader is informed on various other subjects such as how to get heating contracts, how to install heating and ventilating apparatus and the best possible methods to be used in connection with such work.

The book also describes all the principal heating systems using hot water and steam and includes chapters on up-to-date methods of ventilation and the application of the fan to both heating and ventilating.

PROBLEMS OF MODERN SCIENCE. Edited by Arthur Dendy, D.Sc. F.R.S. Size 8½"x5½". Hard cloth covers, 236 pages. Published by Henry Holt & Co., New York City.

In this work the editor has brought together a series of papers presented before the Kings College of London, England, by authorities on various subjects. They are presented in a concise form and in a manner meant for the advanced student and scientist. The subjects covered are mathematics, astronomy, physics, organic chemistry, biology, botany, physiology and anatomy.

Each one of the above subjects is covered in a manner meant to bring forth the most important points in each particular subject and the various authors of the papers have succeeded admirably. The only fault which we find with this book is that it contains no index. The only hint which one gets as to the contents of the book is a list of the subjects as given above. To find any particular part, one must go through the entire chapter on the particular subject.

PRACTICAL PRINTING PROCESSES. By Frank R. Fraprie, S.M., F.R.P.S. Size 7½"x4¾" Hard cloth covers, 56 pages. Published by American Photographic Publishing Company, Boston, Mass.

This book, No. 10 of the Practical Photography series, has already run over 18,000 copies and in this latest edition has been completely revised and enlarged.

Various photographic printing processes are dealt with in the order of their importance and the reader is led through various processes up to the

A Merry Christmas for that Boy of Yours!

Your boy's Christmas will be the happiest ever, if you will send him THE BOYS' MAGAZINE. **It is a gift that lasts a whole year.** This splendid magazine is chock full of just the kind of reading you want your boy to have. Clean, inspiring stories by the world's best writers. Practical and instructive departments devoted to Radio, Mechanics, Electricity, Athletics, Physical Training, Stamp Collecting, Cartooning, etc., etc. Beautiful big pages with handsome covers in colors. A big lot of jokes and comic drawings.

We give away $132.00 in Cash Prizes for the best amateur short stories, drawings, cartoons, articles on radio, mechanics, electricity, etc. There is no reason why your boy should not win some of these Cash Prizes. These Prize Contests are continuous and each issue of THE BOYS' MAGAZINE gives full particulars regarding them.

Subscribe for this great magazine for your boy or for some boy in whom you take a particular interest. It will mean for him a whole year of pleasure, entertainment and instruction.

Special Offer! For only $1.00 we will send THE BOYS' MAGAZINE for a full year beginning with the big December (Christmas) issue. We will send FREE to each subscriber a copy of our book "Fifty Ways for Boys to Earn Money." We will also send the subscriber a handsome Christmas gift card with your name as donor. (Satisfaction or money refunded.)

THE SCOTT F. REDFIELD CO., Inc.,
8228 Main St., Smethport, Pa.

I enclose $1.00 for which enter the following name for a whole year's subscription to THE BOYS' MAGAZINE. Send him his first copy of THE BOYS' MAGAZINE, a Christmas gift card and a copy of your book, "Fifty Ways for Boys to Earn Money," all to reach him on Christmas morning.

Name .....
Street or R. F. D. .....
City ..... State.....
Your Name .....

BLANK CARTRIDGE PISTOL

Protection against Burglars, Tramps, & Dogs

PRICES 50c. $1.00 POST-PAID

Well made and effective; modelled on latest type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard .22 Cal. Blank Cartridges obtainable everywhere. Price 50c., Superior quality $1.00 postpaid. Blank Cartridges, by express, 50c per 100.

JOHNSON SMITH & CO, Dept. 52

Begin Today—Write for My FREE BOOK. I can make a good penman of you at home during spare time. Write for my FREE BOOK, "How To Become a Good Penman." It contains specimens and tells how others mastered penmanship by the Tamblyn System. Your name will be elegantly written on a card if you enclose stamp to pay postage. Write today for book.

F. W. TAMBLYN, 424 Ridge Bldg., Kansas City, U. S. A.

Print Your Own

Cards, circulars, labels book, paper. Press $12. Larger $35 Job press $150. Save money. Print for others, big profit. All easy, rules sent. Write factory for press catalog, TYPE, cards, etc. THE PRESS CO., D-47, Meriden, Conn.

Digitized by Google Original from UNIVERSITY OF CHICAGO

most complicated. The book opens with several pages on general instructions, cautioning the photographer on the importance of cleanliness in photographic work. Blue prints and printing-out papers are then dealt with and formulas given for the making of blue print paper and transparencies. This method of presentation is continued throughout the book and it is replete with formulas setting forth the methods for preparing various printing papers as well as other formulas for the preparation of developers and fixing baths. Directions for sepia toning processes are also given as are directions for applying the same to all kinds of paper.

Throughout the whole each page is full of hints for the photographer and the book should be in the possession of anyone interested in this work. Its one drawback is a complete lack of any table of contents or index but as each page is headed with a description of the information given on that page, the reader will not find much trouble in locating the particular part which he desires.

DISCOVERIES AND INVENTIONS OF THE TWENTIETH CENTURY. By Edward Cressey. Illustrated, 453 pages. Hard cloth covers. Size 8¼"x 5¼". Published by E. P. Dutton & Co., New York City

This book dealing with the various inventions and discoveries of the past twenty-three years is very well compiled and illustrated. Some of the subjects touched on are the development of steam, gas and oil for power, the various developments of gasoline engines, the latest advances in generation and transmission of electricity, improved electric lighting and heating systems, new developments in artificial refrigeration, the latest discoveries in chemistry, the motor car up-to-date, aeronautics, wireless telegraphy and telephony and high speed photography. The chapter on aeronautics is well worth special mention as not only the theory of transportation through the air is dealt with, but photographs of the various latest types of airplanes and dirigibles are shown. The chapter on wireless telegraphy and telephony is practically the same as found in the first chapter of any standard radio hand-book, dealing as it does with the early days of radio history and touching lightly upon some of the newer developments.

Taken as a whole, the book is one which should interest any student of general science.

THE BOOK OF WIRELESS TELEGRAPH & TELEPHONE. By A. Frederick Collins. Illustrated, 227 pages. Hard cloth covers. Published by D. Appleton and Company, New York.

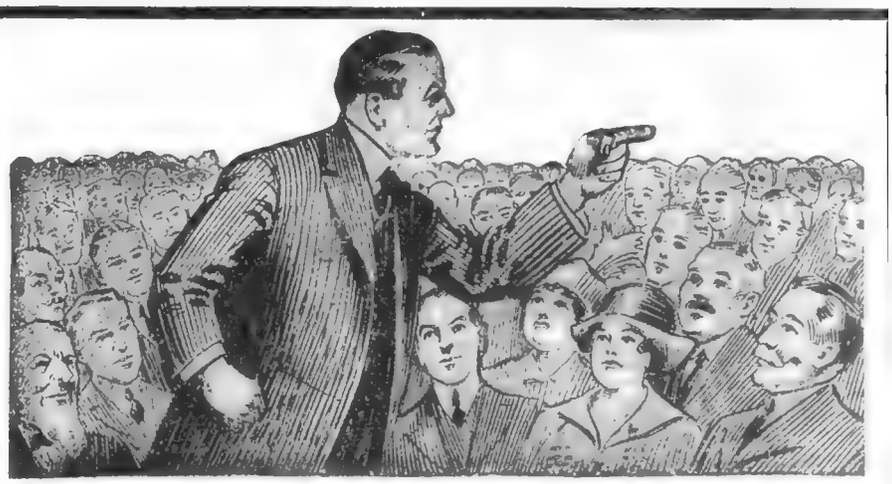
This book is one which should appeal to every student of radio telegraphy and telephony as well as to the broadcast listener. It begins with a short explanation of the simplest types of radio telegraph transmitters and receivers explaining carefully how each piece of apparatus is to be constructed. The text goes on to deal with the construction of an antenna and the learning of the code. A complete chapter is devoted to the subject of how wireless works and analogies are used to illustrate the various points. The drawings used in connection with this book are exceedingly plain and easily understood. Commercial transmitters and receivers are dealt with in a comprehensive manner and certain parts of the chapter on receiving instruments will interest the how-to-make-it fan very greatly. Several instruments are thoroughly described in detail and all the necessary information for their construction is given. The theory of tuning is dealt with in very concise and plain manner and the subject of continuous wave transmission and reception is thoroughly covered.

The design and construction of vacuum tube transmitters as well as the theory of their operation is set forth in separate chapters and the book ends with a chapter of useful information giving rules and regulations for the operation of radio apparatus. An appendix of terms used in radio work makes the book quite valuable to all those interested in the subject. A complete index also adds to the usefulness of the book.

THE MEANING OF RELATIVITY. By Albert Einstein. 119 pages. Hard cloth covers, size 7¼"x5". Published by Princeton University Press, Princeton, N. J.

This is a book written as only Professor Albert Einstein can write. To anyone interested enough in the subject of relativity to go into the necessary calculus, this book will be a veritable gold mine. It consists of four chapters, namely Space and Time in Pre-Relativity Physics, The Theory of Special Relativity, The General Theory of Relativity and The General Theory of Relativity, continued. The book is entirely filled with pages of abstruse mathematical calculations which render it very valuable in the understanding of the more complicated parts of the meaning of relativity. If it is true, and it has been

(*Continued on page 927*)



Learn Public Speaking

10 LESSONS FREE

Write — quick — for particulars of this extraordinary offer; an opportunity you will never forget if you take advantage of it. Ten lessons in effective public speaking absolutely FREE to those who act promptly, to introduce our course in localities where it is not already known.

We teach you by mail to become a powerful and convincing speaker—to influence and dominate the decisions of one man or an audience of a thousand. We have trained hundreds and helped them to increase their earnings and their popularity. Learn, in your spare time at home, how to overcome "stage fright" and conquer fear of others; how to enlarge your vocabulary; how to develop self-confidence and the qualities of leadership; how to RULE others by the power of your speech alone; how to train your memory. Our

WHAT THE COURSE TEACHES YOU

How to talk before your club or lodge;
How to address board meetings;
How to propose and respond to toasts;
How to make a political speech;
How to tell entertaining stories;
How to make after-dinner speeches;
How to converse interestingly;
How to write better letters;
How to sell more goods;
How to train your memory;
How to enlarge your vocabulary;
How to develop self-confidence;
How to acquire a winning personality;
How to strengthen your will power and ambition;
How to become a clear, accurate thinker;
How to develop your power of concentration;
How to be the master of any situation.

New Easy Method

perfected and taught only by Prof. R. E. Pattison Kline, former Dean of the Public Speaking Department of the Columbia College of Expression, can be learned in 15 minutes a day. Prof. Kline is one of the foremost authorities in the country on public speaking and mental development. Do not let this chance escape you.

Offer Limited

Send This Free Coupon Now

This Special Offer of TEN LESSONS FREE is made strictly for advertising purposes and will be withdrawn without notice. Write now, before it expires, and receive full particulars with enrollment blank by return mail. No obligation of any kind. Just tear off and mail this free coupon—or a postal will do.

FREE LESSONS COUPON

NORTH AMERICAN INSTITUTE,
Dept. 7441, 3601 Michigan Ave., Chicago, Ill

I am interested in your course in Effective Public Speaking and your offer of ten lessons free. Please send particulars. It is understood that this request places me under no obligation of any kind.

.....

.....

Digitized by Google

Original from UNIVERSITY OF CHICAGO

U.S. PATENTS

SEND FOR THIS FORM

Don't Lose Your Rights

Before disclosing your invention to anyone send for blank form "Evidence of Conception" to be signed and witnessed. A sample form together with printed instructions will show you just how to work up your evidence and establish your rights before filing application for patent. As registered patent attorneys we represent hundreds of inventors all over the U. S. and Canada in the advancement of inventions. Our schedule of fees will be found reasonable. The form "Evidence of Conception" sample, instructions relating to obtaining of patent and schedule of fees sent upon request. Ask for them,—a post card will do.

LANCASTER & ALLWINE

255 OURAY BLDG.,
WASHINGTON, D. C.
"Originators of form Evidence of Conception"

PATENTS

TO THE MAN WITH AN IDEA

I offer a comprehensive, experienced, efficient service for his prompt, legal protection and the development of his proposition.

Send sketch, or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information and form for properly disclosing your idea, free on request. Write today.

RICHARD B. OWEN, Patent Lawyer
164 Owen Building, Washington, D. C.
2276-8 Woolworth Bldg., New York City

PATENTS

C. L. PARKER
Formerly Member Examining Corps, U. S. Patent Offices.
PATENT LAWYER
McGill Bldg., Washington, D. C.
Patents, Trade Marks, Copyrights, Patent Litigation
Handbook for Inventors, "Protecting, Exploiting and Selling Inventions," sent upon request.

PATENT ADVICE

Edited by Joseph H. Kraus

In this Department we publish such matter as is of interest to inventors and particularly to those who are in doubt as to certain Patent Phases. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries are published here for the benefit of all readers. If the idea is thought to be of importance, we make it a rule not to divulge all details, in order to protect the inventor as far as it is possible to do so.

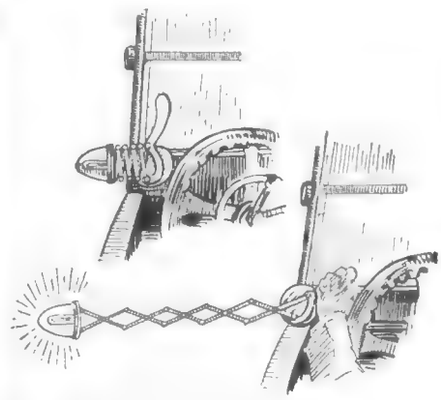
Should advice be desired by mail a nominal charge of $1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.

NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.

TURN INDICATOR

(759) A. Levine, Los Angeles, Cal., requests our opinion of an automobile right and left turn indicator made as shown.

A. We do not advise applying for a patent upon your automobile extension light, for indicating right and left turns, for the simple reason that such extension arms have not met with very great favor. Here in New York signaling devices of this nature, entirely automatic, and operating from the clutch for the stop signal, and from the wheel for the right and left turn, are being sold very cheaply. Indicators of the nature you describe have not met with very favorable markets. Attempting to place this device upon the market is a gambling venture which we do not advise you to undertake.

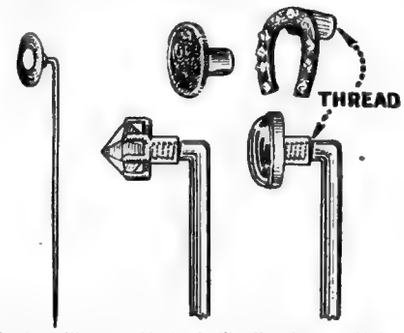


Some auto turn indicators similar to the above are manufactured at present and haven't found a healthy market.

DOUBLE PHONOGRAPH RECORD

(760) Samuel H. Landis, Lane, Pa., asks why phonographic records are not made so that one song can be played with a hill and dale producer and another with a lateral cut producer, both on the same face of the same record.

A. We can answer your question very simply. Take a hill and dale record, place it upon your phonograph, and set your needle to play laterally cut records. You will find that, regardless of what you do, you will get a sound. Reverse the process, and use laterally cut record with a hill and dale reproducer, and again you will reproduce music with a great many distortions and scratching noises. Consequently, your device, although of interest, could not very well be perfected, because of the fact that both records would be heard simultaneously, one a little weaker than the other.

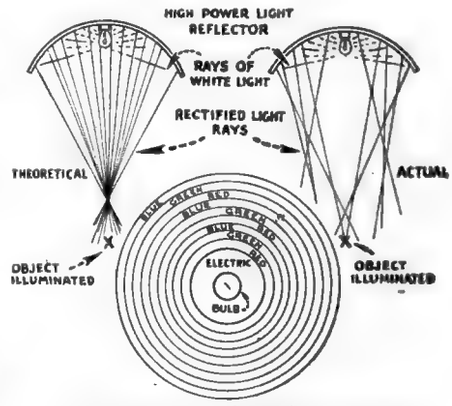


Tie-pins with removable heads like the above could hardly be sold "by the millions" as the inventor asserts.

REMOVABLE TIE PIN STONES

(761) William King, Wonessen, Pa., asks us what we think of the idea of making tie pins so that the stones or fronts can be removed.

A. We have recently advised four individuals against trying to patent either removable stones for tie pins, or removable tie pin fronts. We do not agree with you when you state that the pins could be sold by the millions.



For portraying articles in their day-light colors the above device is good if it will work, actually.

NATURAL LIGHT REFLECTOR

(762) Don Lowery, Moundsville, Fla., asks whether a lamp for interior decorating made as shown, would give objects their true lustre.

A. We do not believe that the reflector which you have designed will have any effect whatever, and it is our opinion that instead of giving objects their true lustre, the reflector will throw a series of concentric colored bands upon the object toward which it is turned.

The experiment is nevertheless, not too costly to try and we would suggest that you build a model before proceeding further. An absolutely perfect parabolic reflector and pure white light are necessary in this test.

(*Continued on page* 924)

INVENTORS PROTECT YOUR IDEAS

Write for our Guide Book, **HOW TO GET A PATENT**, and Evidence of Invention Blank, sent Free on request. Tells our terms, methods, etc. Send model or sketch and description of your invention and we will give our opinion as to its patentable ture.

RANDOLPH &
Dept. 172, WASHING

Name
Street
State

Digitized by Google
Original from UNIVERSITY OF CHICAGO

PATENTS

EXPERIENCE SERVICE

PATENTS

CLARENCE A. O'BRIEN

PATENT ATTORNEY

REGISTERED IN UNITED STATES PATENT OFFICE

MEMBER OF THE BAR OF

SUPREME COURT OF UNITED STATES, COURT OF APPEALS DISTRICT OF COLUMBIA,
SUPREME COURT DISTRICT OF COLUMBIA, UNITED STATES COURT OF CLAIMS.

PRACTICE CONFINED TO PATENTS AND TRADE MARKS.

PATENTS

PROTECT YOUR IDEAS

ANY NEW article, machine, design or improvement thereof, or any new combination of parts or improvements in any known article which increases its efficiency or usefulness, *may be patented*, if it involves invention.

SCIENCE INVENTION INDUSTRY

ECONOMY EFFICIENCY INITIATIVE

Drafting and Specification Room of Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

IF YOU HAVE ANY NEW IDEAS

which you feel are useful, practical and novel, *take prompt action to protect your rights.* If you have invented any new machine, or new combination of parts of improvement, or any new design or process, SEND DRAWING, MODEL OR DESCRIPTION of it for information as to procedure to secure protection.

Write Today for Blank Form

"Record of Invention"

USE THE COUPON attached, and immediately upon its receipt I shall send you this form to be returned to me with drawing, description or model of your idea; promptly upon receiving your idea I shall write you fully as to procedure and costs.

No Charge for This Information

All communications are held in strict confidence. My personal, careful and thorough attention is given to each case. I offer you efficient, reliable and prompt service—based upon practical experience. *Highest references.*

WRITE TODAY for free book *"How to Obtain a Patent."* This book will give you valuable information, and it may save you much time and effort. *Send for it, NOW.*

My practice is devoted *exclusively* to United States and Foreign Patents and Trade Marks. Write me freely, frankly and with full confidence; it is very probable that I can help you. *Write TODAY.*

CLARENCE A. O'BRIEN, Patent Attorney, 53A Security Savings & Com'l Bank Bldg.
Directly across street from Patent Office, Washington, D. C.

Please send me your free booklet *"How to Obtain a Patent"* and blank form *"Record of Invention"* without any obligation on my part.

Name .....

Address .....

(IMPORTANT: WRITE OR PRINT NAME CLEARLY)

HOW TO OBTAIN A PATENT

Digitized by Google

Original from UNIVERSITY OF CHICAGO

Look Here!

I Guarantee to make you a DRAFTING EXPERT!

If you're earning less than $100 a week, GO INTO DRAFTING! I guarantee to train you AT HOME, to make you a high-priced DRAFTING EXPERT quick! Send for my free book, find out about the wonderful opportunities to earn big money in this easy, fascinating business. Get my astonishing offer to train you until you're actually placed in position paying

$250 to $400 a Month!

Common schooling all you need! I train you by my copyrighted "JOB-WAY" instruction. I cover every branch of Drafting by giving you actual JOBS to do. No books or useless theory to waste your time. My graduates are SUCCESSFUL—they step into big-pay EXPERT'S jobs immediately after completing my instruction. So I guarantee to make YOU an EXPERT or to refund your money!

FREE $19 Experts' Drafting Outfit

"JOB-WAY" training makes you a DRAFTING EXPERT quick because you learn to do actual JOBS with the same instruments you will use when employed at a big salary. To encourage you to START RIGHT NOW, I will give you this complete EXPERT'S outfit FREE. Coupon brings complete information.

LEARN AT HOME!

Thousands of big-salaried jobs all over the country looking for DRAFTING EXPERTS! Railroads, factories, builders, architects, ship yards, auto plants, Cities, Counties, States, and the U. S. Government all calling for Drafting Experts, all waiting for you to take the big pay job. Mail coupon, get my free book. Let me tell you the rest of this story personally. Address

2 Drafting Books FREE!

CHIEF DRAFTSMAN COYNE SCHOOL OF DRAFTING
Dept. 136 1-9 S. Ashland Ave., Chicago

CHIEF DRAFTSMAN
COYNE SCHOOL OF DRAFTING
Dept. 136 1-9 S. Ashland Ave., Chicago

Without obligating me in any way please send me your book, "Drafting, the foundation of industry" absolutely free. Also complete information of your rapid home-study Drafting course and Free instruments.

Name .....

St. No .....

City .. .... State.....

Patent Advice

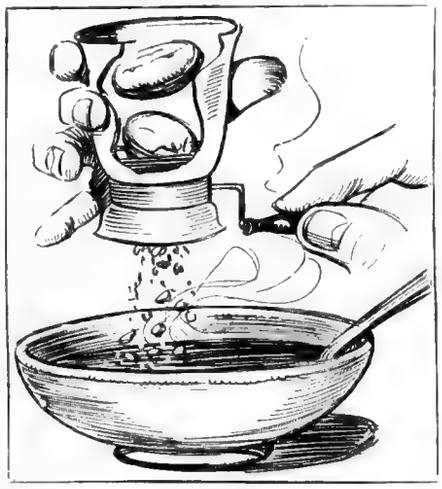
(*Continued from page 922*)

INDIVIDUAL CRACKER CRUSHER

(763) John Lisinski, Mt. Carmel, Pa., asks our opinion of an individual cracker crusher for restaurants.

A. Modern restaurants have regular cracker crushers. Some of the smaller restaurants are using a small ringer for this purpose. In neither case are these cracker crushers put to any great use because crushed crackers are not being served in restaurants, it being considered more refined to serve the whole cracker, and except in cakes or stuffings, the crushed material is not of value. If crushed crackers are desired, restaurants can purchase them in cartons all ready in a crushed and sifted form, so that all the granules are uniform in size.

We would not suggest applying for patent on the invention here described.



Since whole crackers are served in restaurants and since very few people crush them when eating, the above idea is hardly valuable.

VACUUM WINDOW GLASS

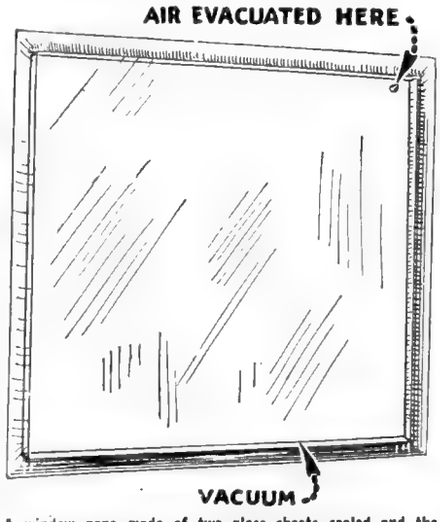
(764) S. A. Lind, Alameda, Cal., asks us for our opinion on a window glass made of two panes sealed at the edges and the air exhausted.

A. Our opinion of a double sheet pane of glass with a vacuum between the individual sheets is very poor indeed.

In the first place such glass could not be cut and made to fit various sized window frames. Consequently, an immense amount of glass would have to be kept in stock.

In the second place, this glass is liable to breakage to a greater extent than ordinary window glass, due to the fact that the point at which the glass is exhausted must be much thinner than other portions of the glass. Furthermore, glass of this nature cannot be made to fit ordinary frames, because of the exhausting projection; the sheets of glass, unless very thin indeed, would have different amounts of expansion, due to the fact that one side is being heated while the other is kept cool. Last but not least, the expense of manufacture is prohibitive. Atmospheric pressure would tend to break the panes.

The idea is, as stated before, not practical, and we would not advise applying for a patent.



A window pane made of two glass sheets sealed and the air exhausted is not practical for a number of reasons.

CAN YOU

think of a simple, practical idea that will fill one of the many requests we have on file for new inventions? It may mean a fortune for you. Thousands of things are needed Right Now. Your brains can help. Send today for our great new book —"Inventions and Trade Marks, Their Protection and Exploitation" and learn more about making money from ideas than you ever knew before. It tells many things that are wanted, too.

A postal will do—it is free.

We help our clients, without charge, to get the dollars out of their ideas—having facilities none others possess.

Advice Free.
Don't delay—get the book at once.

AMERICAN INDUSTRIES, INC.
225 Patent Dept., WASHINGTON D.C.

PATENTS ADVERTISED For SALE FREE
In Invention and Manufacturing Supplement.
Published for the man with an idea Send for free sample copy. One year's subscription 50c.

PATENTS

Hand Books on Patents, Trade Marks, etc., sent free. Our 77 years of experience, efficient service, and fair dealing assure fullest value and protection to the applicant. The Scientific American should be read by all inventors.

MUNN & CO.
618 Woolworth Building, New York
Tower Bldg., Chicago, Ill.
Scientific American Bldg., Washington, D. C.
Hobart Bldg., 582 Market St., San Francisco, Cal.

PatentEssentials

By John F. Robb, LL.B., LL.M., M.P.L.

How to procure a patent, how to protect it, how to draft patent claims and conduct cases and special proceedings. Everything pertaining to patents and patent law is covered in simple language in this new book by an eminent patent specialist. It will prevent worry and save money for Investors, Executives, Engineers, and Lawyers. Satisfaction or money back.

8 vo. Cloth. 452 pages. Illustrated. $5.00 net; by mail, $5.16
FUNK & WAGNALLS COMPANY, Dept. 692, New York

PATENTS

Trade-Marks, Copyrights and Patent Litigation
Write for advice and instructions how to proceed, costs, etc.
Hand Book with illustrations of 100 Mechanical Movements sent free on request.

ALBERT E. DIETERICH
Patent Lawyer and Solicitor
Successor to Fred G. Dieterich & Co.
601 OURAY BLDG. WASHINGTON, D. C.

PATENTS

As one of the oldest patent firms in America we give inventors at lowest consistent charge, a service noted for *results*, evidenced by many well known Patents of extraordinary value. *Book, Patent-Sense, free.*
Lacey & Lacey, 644 F St., Wash., D. C. Estab. 1869.

PATENTS

BOOKLET FREE — HIGHEST REFERENCES
PROMPTNESS ASSURED — BEST RESULTS
Send drawing or model for examination and report as to patentability.

WATSON E. COLEMAN, Patent Lawyer
644 G Street, Washington, D. C.

INVENTORS
Let me prepare working drawings for your invention before you have a model made. I design automatic machinery, develop ideas into a practical shape, and perfect them. Estimates furnished free.
HENRY WETTSTEIN, Mech. Engineer
150 Nassau Street New York City

Digitized by Google
Original from UNIVERSITY OF CHICAGO

A THEORY BASED ON MISTAKEN IMPRESSIONS

(765) M. Knickerbocker, Mokena, Ill., has evolved a theory in which radio waves are to be focussed to one spot. He assimilates radio waves to light waves and sound waves and asserts that wireless waves are reflected by a convex mirror.

A. Radio waves transmitted through the ether cannot be focussed the same as light or heat waves. The waves pass through glass very readily. The vibrations differ from sound in wave-length, medium of transmission and speed of travel. Sound waves travel at a rate of roughly 1,190 ft. per second through the air, with an additonal speed of 2 ft. more per second for every degree rise in temperature of the surrounding atmosphere over zero C. Electricity on the other hand, travels at 186,500 miles per second. Temperature has no effect upon its speed of travel; at least normal temperature variations do not effect it. The ether is the medium of its transmission.

Sound travels better in denser mediums, traveling 1,315 ft. per second in water at O° C, whereas radio does not change its speed, as it always has the same medium of transmission.

CLOTHES HANGER AND REMOVABLE STONES FOR TIE PINS

(766) William E. King, Monesseu, Pa., asks for advice on two ideas. The first is a hanger for garments; the second is a suggestion for removable stones for tie pins.

A. In our opinion, the suggestions advanced by you are about half good. Coat hangers such as you have designed, may without a doubt, be very easily constructed, but the grip arrangement which you intend to use for holding light clothes, is a very undesirable feature. A slight tug at the flimsy garment, if held on one of these coat hangers, would tear it, thus destroying the garment's further usefulness. A far better suggestion would be to employ a rubber pad, fitted with a steel spring, under which the garment could be held. Needless to say, the garment hangers of your particular design and construction, are rather expensive, even though you have worked out the manufacturing details to a very great extent.

Less favorable is your idea of inter-changeable tie pins. It is much easier to retain a tie pin which is a complete unit, than it is to hold on to a separable device. The cost of the shank alone in these tie pins is practically negligible, and it is the stone or the finer design or figure which is the most valuable part of pins. Therefore, your interchangeable mechanism, will not reduce the cost of the tie pins to a very great extent, and the undesirable feature is that each change has to conform to the same general tie pin shape. Openwork tie pins could not be employed or attached to your device.

You see, therefore, that we do not have very much faith in either of your two ideas, and would be skeptical toward advising you to apply for a patent on either.

CLOCK-WORK OPERATED MECHANISM

(767) Everett A. Manning, Decatur, Ill., asks if he can patent a device depending on a clock mechanism for its operation.

A. Of course, a device using the works of an alarm clock for its functioning, and depending solely upon the running of the clock for its operation could be patented if otherwise conforming to statute.

If it depends upon one particular style of clock, then it is an entirely different matter, but inasmuch as nearly all clocks run and most are equipped with alarms, and inasmuch as the patents on clocks or clock mechanisms are so old that they have long become public property, we see absolutely no reason for your not placing your device upon the market, if it is worth while.

IGNITION CUT-OFF

(768) L. L. Meyer, Lead, So. Dakota, has designed a thermostatically controlled device for automobiles which will cut off the ignition as soon as the temperature of the water of the cooling system reaches a predetermined point.

A. In your communication, requesting patent advice, you have given a design of rather ingenious principle, but upon which we cannot favorably comment. There are many reasons for this, a few of which may suffice.

It would be very undesirable, for instance, to install one of these systems upon a car, and after driving in low gear, as through country towns, so as to heat up the motor considerably, and after finally reaching a ferry pier or railroad crossing, or an intersection in a busy street, to have this automatic device turn off the ignition and stop the car dead. It may be that the driver had attempted to cross the railroad tracks before the gates were lowered, and an approaching train was bearing down upon him, enabling him to cross the track ordinarily in safety, but because the ignition went dead, to stall, and perhaps send the car's occupants into the region of the Great Beyond. This is not a very satisfactory outlook, we can assure you. If your device is merely to sound an alarm, then it will have no value either. The system is far more expensive than the motometer, both to install and to operate, the latter requiring no energy of any sort, while your system consumes current constantly.

In our opinion such a system would never find a favorable market.

PATENTS TRADE-MARKS AND COPYRIGHTS

OUR OFFER: No Charge for Examination and Instructions

YOUR FIRST STEP

Before disclosing an invention the inventor should write for our blank form *"Record of Invention"*. This should be signed and witnessed and returned to us together with model or sketch and description of the invention for examination and instructions. *No charge for the above information.*

Our Three Books Mailed Free to Inventors

Our Illustrated Guide BOOK

How to Obtain a Patent

Contains full instructions regarding U. S. Patents. Our Methods, Terms, and 100 Mechanical Movements illustrated and described. Articles on Assignment or SALE OF PATENTS, Patent Practice and Procedure, and Law Points for inventors.

Our Trade Mark Book

Shows the value and necessity of Trade-Mark Protection and gives information regarding *Trade-Marks and unfair competition in trade.*

Our Foreign Book

We have Direct Agencies in all Foreign Countries. We secure Foreign Patents in shortest-time and lowest cost.

SPECIALIZATION Our Staff

The field of invention is so vast that it is impossible for any one to become an expert in all the different classes of invention. For this reason Victor J. Evans & Co employed a number of patent lawyers and expert draftsmen who have been selected for their special knowledge and ability in certain lines of invention.

RADIO AND ELECTRICAL CASES A SPECIALTY

All Communications and Data Submitted Strictly Confidential.

THE VALUE OF YOUR PATENT

Will depend upon the skill and care with which your case is handled. We spare neither time nor pains to secure the broadest possible patents. We shall be happy to meet inventors in person at our offices or to advise them by letter, and they are at liberty to write us any time they desire information. Their plans will receive careful consideration, an honest opinion and a prompt reply. We have a personal interest in the successful outcome of every case we handle, and inventors can rely on receiving the highest grade of work and the most thorough service from us.

WE REGARD A SATISFIED CLIENT

As our best advertisement, and will furnish to anyone, upon request, lists of clients in any state for whom we have secured patents.

Highest References—Prompt Attention—Reasonable Terms

WRITE TODAY

Free Coupon

VICTOR J. EVANS & CO.

Patent Attorneys

New York Offices 1007 Woolworth Bldg. | Philadelphia Offices 714-715 Liberty Bldg. | Pittsburgh Offices 514 Empire Bldg.

Chicago Offices, 1114 Tacoma Bldg. | San Francisco Offices, Hobart Bldg.

Main Offices, 779 Ninth Street, Washington, D.C.

Gentlemen: Please send me FREE OF CHARGE your books as described above.

Name ..... Address .....

Digitized by Google

Original from UNIVERSITY OF CHICAGO

Play a Conn
For Pleasure and Profit

Take a tip from such popular artists as

TED LEWIS, the famous jazzical clown, who says many of the effects he gets are possible *only with the Conn saxophone:*

PAUL BIESE, renowned soloist and Columbia record maker, who with his orchestra members says Conns are *the last word in perfection;*

DON BESTOR, director of the popular Benson orchestra of Victor record fame, which is *exclusively equipped with Conn instruments;*

FRANK WESTPHAL, whose Rainbo Garden orchestra makes records for Columbia, and all members of which *acclaim Conn supremacy.*

CONN is the only maker of every instrument used in the band. Choose the instrument that suits your talent. To be sure it's best, *insist upon Conn.*

For fifty years Conns have been the standard of quality, endorsed by the leading bandmasters, soloists, symphony and opera conductors, including the great Sousa, because Conns are perfect in tone and tune; easy blowing; reliable in valve, slide or key action; perfectly balanced, handsomely finished.

More Conn saxophones are sold than any other make in the world—*a tribute to quality.* Send for complete information on exclusive features, including hydraulic expansion of taper branches, insuring easy blowing, perfect tone.

Conn violins are of highest quality, beautiful tone. Conn drums are endorsed by leading drummers.

FREE TRIAL, EASY PAYMENTS. Write today for details, mentioning instrument that interests you.

Dealers and agents throughout the country. Factory branches in all large cities.

C. G. CONN, Ltd. 156 Conn Bldg.
ELKHART, INDIANA
Highest Honors at World Expositions

CONN
WORLD'S LARGEST MANUFACTURERS OF HIGH GRADE BAND AND ORCHESTRA INSTRUMENTS

CUT ... JR MUSICAL BUMP

PERPETUAL MOTION

(769) Joseph McDonal, Providence, R. I., asks to whom he could apply for bona-fide advice on perpetual motion.

A. You may feel free to discuss your perpetual motion plan with us, and we will give you the best advice possible. We do not hold the inventor of a perpetual motion machine up to ridicule and scorn, and neither do we deride an inventor for his opinion. We try to explain the matter as clearly as possible, although at times we find it rather difficult to convince perpetual motion inventors that the machine they have designed is impossible of operation.

If you will make your sketch clear, and give us your own reasoning on the subject, we will attempt to point out your error, if such exists.

PATENT ATTORNEY VS. INVENTOR

(770) R. J. Mark, Lincoln, Neb., asks if a questionnaire which he has received from a patent attorney, should be filled out and if the attorney intends to steal the idea if it should be filled out.

A. We do not believe the patent firm means anything in sending you the questionnaire. All questionnaires of this nature are required by certain firms to be executed merely for convenience, not because of any attempt to steal the idea. The main point at issue is that they desire to determine whether or not you have fully protected yourself, so we would advise you to make a truthful reply to the questions, and if the device originated fourteen or eighteen years ago, state so. Be sure, however, that you claim the day of the making of the first sketch, etc., and also the date when the model was built.

HOTEL LOCK AND TIE PINS

(771) A. Lippert, Toronto, Canada, asks us for advice on a duplex lock for hotels which can be opened from the outside even though the key is in the lock, and if he should patent two safety tie-pin shanks.

A. We do not believe that your idea of a hotel lock will have any value for the simple reason that if the hotel lock can be opened from the outside, regardless of whether patron's key is in the lock or not, thieves with pass-keys could easily open the lock. If electric circuits were placed upon the lock so that any attempt to tamper with it while there is a patron sleeping inside the room would alarm the sleeper, then those circuits, or the bell could be destroyed. Besides there are about fourteen different attachments made for ten cents each to be slipped between the door jams and the door, which permit the placing of a small catch across the back of the door, securely locking the door and preventing intrusion. Consequently, your dual lock would be worthless.

With reference to your wavy pins, and your other stick pins, we would state that the former style is not new at all, having been in use a great many years. It is now practically obsolete. The pin with the small V may be of some value, but we doubt very much if it will meet with any degree of favor, in that the structure of the pin is such as to tear ties in an attempt to extract the pin. It would require considerable fussing to loosen a good quality silk tie from the pin, and even more fussing if the user were wearing a heavy crocheted neck tie.

ROTARY GAS ENGINE.

(772) A. H. Phillips, Hulberton, N. Y., submitted a model of a rotary gas engine, the details of which are omitted for the protection of the inventor. The blades of the turbine revolve and form their own explosion chambers, but the manner in which they did so, was very unique.

A. Of the thousands of patent advice inquiries which we receive, regarding rotary gasoline motors, the one submitted by you is better than any which have thus far been called to our attention.

We do not doubt that if this patent is properly handled, a very clever motor would be developed, which is bound to "take" but it will require considerable money to do this. We would suggest that you have a full-size model built after you have secured the proper patents. There are several details which will have to be worked out, namely, the method of making the vents tight and the control of the gears. Your descriptions are extremely clear, and for the crude model you have designed and built, its working principles are clearly explained. We wish you the best of success in your venture.

STATIC ELIMINATOR.

(773) Leonard Peulter, Fort William, Ont., Canada, has designed a static eliminator for radio sets made in the form of ebonite and wax rods. He states that these substances conduct static electricity and are used as insulators in radio sets. He then illustrates his theory by a physical experiment.

A. The static eliminator which you have devised may suggest a possibility to you, but is a complete absurdity to any one who knows what static electricity is. Static electricity is not conducted by hard rubber, bakelite, glass or resin. It is, nevertheless, charged upon the surfaces of these materials when they are rubbed with proper substances, and metal is used to lead the charge off. Consequently, metal combs and brushes are used in static machines to collect electricity formed on the plates.

Big loads are easy for the Auto-Wheel

Two, three, four happy boys are an easy load for the sturdy Auto-Wheel Coaster Wagon. Auto-Wheel Coasters are built for hard play. See how the body is put together. Not just nailed, but mortised. Auto-Wheel Coasters are so strong that we use them in our factory for carrying loads up to 1,000 pounds (half a ton).

Auto-Wheel
Coasters and Auto-Carts

The mortised joints are only one of the features which make Auto-Wheel Coasters sturdy and substantial. Other features are: rubber-tired disc wheels, steel-tired disc or wood spoke wheels—all wheels interchangeable—hand brake, special hub cap and locking pin, special hound brace, self contained roller bearing. Write for catalog which shows all models of the Auto-Wheel Coaster and the Auto-Cart, the Auto-Wheel's junior companion for little brother and sister. Send the names and addresses of three local coaster wagon dealers, and we will give you a year's subscription Free to the "Auto-Wheel Spokesman," a dandy magazine for boys.

Auto-Wheel Coaster Co., Inc.
NORTH TONAWANDA, N. Y.

MASTER ELECTRICITY AT HOME

Send for my HOME-STUDY CATALOG, which is a STRAIGHT-FROM-THE-SHOULDER TALK about your future in the Electrical field. It contains no misleading promises such as "EARN $10,000 A YEAR" or "BECOME AN ELECTRICAL EXPERT IN A FEW MONTHS." If you are seeking to better yourself, you are far too intelligent to believe such rot.

DO YOU WANT A BETTER JOB?

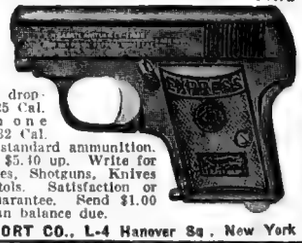
I am in business to help deserving men. Let me help you as I have helped thousands. My instructions are right to the point. My catalog speaks volumes for any man who wants to be a success in the electrical field. Write for it TODAY.

Electrical Handbook and Slide Rule Course presented to every one who answers this advertisement for prompt enrollment.

BURGESS ELECTRICAL SCHOOL
Yorke Burgess, Superintendent
Dept. I. 745 E. 42nd Street, Chicago, Ill.
Canadian Branch, 201B Crawford St., Toronto

EXPRESS 25 CAL. 7 SHOT AUTOMATIC **$9.50** POST PAID

Three Safeties with Safety Grip



Made of finest drop-forged steel. 25 Cal. Express, with one safety $8.00. 32 Cal. $11.50; shoots standard ammunition. Revolvers from $5.40 up. Write for catalog of Rifles, Shotguns, Knives and other pistols. Satisfaction or money back guarantee. Send $1.00 and pay postman balance due.

PACIFIC IMPORT CO., L-4 Hanover Sq., New York

"BECOME A LIGHTNING TRICK CARTOONIST"

Make money chalk talking. Send $1.00 for snappy program of trick drawings, with instructions by a professional cartoonist. Satisfaction guaranteed. Circular free. **Balda Art Service, Dept. 4, Oshkosh, Wis.**

Digitized by Google Original from UNIVERSITY OF CHICAGO

Book Review

(*Continued from page 921*)

said many times, that there are only twelve men in this world that understand relativity, here is each one's chance to learn of this subject if they are willing to go through the deep calculus computations given in this book. A complete index gives ready references to the various calculations and other rules set forth in the book.

LABORATORY MANUAL OF PHYSICAL CHEMISTRY.. By Davison and Van Klooster. 182 pages, hard cloth covers, size 9¼"x6". Published by John Wiley & Sons, New York City.

This book is one which is used in the physical chemistry laboratory of the Rensselaer Polytechnic Institute and other colleges of this country. It outlines tweny-four useful experiments in physical chemistry, many of the exercises being those which are not found in other works of the same nature. The book will make a valuable addition to the library of any chemical student as each experiment is thoroughly described and the necessary information for the completion of the same is given.

The last few pages of the book are devoted to tables which will be of constant use to the performer of the experiments outlined in the volume, and following these tables will be found blank pages of graph paper for the construction of curves plotted from the experiments performed. For easy reference, each experiment is listed with its page number in the table of contents. In order that the experimenter may have full information on the work, a list of reference books is given from which he can obtain further information on the work at hand.

RADIO-PHONE RECEIVING. By Erich Hausmann, Sc.D., Alfred N. Goldsmith, Ph.D., Louis A. Hazeltine, M. E., John V. L. Hogan, John H. Morecroft, E. E., Frank E. Canavaciol, E. E., Robert D. Gibson, E. E., Paul C. Hoernel, E. E., and Michael I. Pupin, Ph.D., Sc.D., L.L. D. Illustrated, 183 pages, hard cloth covers, size 7½"x4¾" Published by D. Van Nostrand Co., New York City.

This book, written by nine experts in the radio field is a clear and concise explanation of the phenomena and theory of radio. Each expert has written on a subject for which he is most noted and, therefore, the cream of radio knowledge is presented to the reader. The tuning of the radio receiving circuit is very clearly explained as is also the theory and practice of reception with the use of crystal detectors.

The vacuum tube detector and amplifier is dealt with in a manner which presents it in the easiest manner to the amateur. Amplification is put forth in theory and practice and the regenerative and heterodyne circuits are fully explained.

The growth of radio phone broadcasting and its value to the public is mentioned and a complete chapter is devoted to this work. In this latter chapter an insight is given into the workings of a radio phone broadcasting station.

Taken all in all the book is one which would be well worth reading by the amateur as well as the broadcast listener as it will give a better knowledge of the workings of all types of radio apparatus.

WRINKLES WANTED

HAVE you solved a knotty problem in your radio set in an extremely simple way? Have you found a short-cut in construction that saves times and worry? If you have, why not give the host of amateurs the benefit of your idea and at the same time benefit yourself? In the RADIO WRINKLES columns of SCIENCE AND INVENTION there are numbers of these ideas published every month. The ideas must be furnished by the amateurs and experimenters actually engaged in the work of constructing and experimenting with radio sets. AND DON'T FORGET. The regular $1,000 in prizes given monthly by this magazine is available to contributors to this department.

Aviation is Still in its Infancy

Aviation Brings Quick Success Fascinating—Daring—Big Paying

To young men of daring no other field of work offers such a fascination, such high pay, nor such opportunities for quick success as the field of Aviation. As yet, aviation is practically in its infancy. NOW is the time to get in.

PREPARE FOR ONE OF THESE POSITIONS

- Aeronautical Instructor $60 to $150 per week
- Aeronautical Engineer $100 to $300 per week
- Aeronautical Contractor Enormous profits
- Aeroplane Repairman $60 to $75 per week
- Aeroplane Mechanician $40 to $60 per week
- Aeroplane Inspector $50 to $75 per week
- Aeroplane Salesman $5000 per year and up
- Aeroplane Assembler $40 to $65 per week
- Aeroplane Builder $75 to $200 per week

Amazing Opportunities In Airplane Industries

In the automobile industry and in the moving picture business hundreds of men got rich by getting in at the start. They made their success before others woke up. Today, these lines offer no greater opportunities than a hundred and one others. BUT AVIATION IS NEW. Get in while there is an opportunity. All over the country there will be a clamor for trained men. It will not be a question of pay but of getting capable men.

A Sure and Easy Method of Becoming an Aviation Expert $50 to $150 per Week

The study of aviation is almost as fascinating as the actual work. Every lesson is full of interest. That is why it is easy to learn aviation. You do not have to make yourself study—it is like reading an interesting book that tells you things you have always wanted to know. Only one hour each evening will give you the basic training in a surprisingly short time.

One student, S. F. McNaughton, Chicago, says: "Your lessons are like a romance, and what is more, after one reading, the student gets a thorough understanding. One never tires of reading them." James Powers Pa., another student says: "I am indeed surprised that such a valuable course can be had from such practical men for so little cost."

Personal Instruction By Experienced Men

Men who have had actual experience give you personal attention. They select the lessons, lectures, blueprints and bulletins. They tell you things that are essential in everyday practice. Each lesson is easy to read and understand.

Get Big FREE Book Now

Send coupon below for New Book, just out, "Opportunities in the Airplane Industry." It is interesting and instructive. It will show you many things you never knew before about aviation. Due to shortage of paper we could get only a limited supply of these books—send the coupon before they are all gone.

American School of Aviation
Dept. 7451
3601 Michigan Avenue, Chicago, Ill.

AMERICAN SCHOOL OF AVIATION
3601 Michigan Ave., Dept. 7451, Chicago, Ill.

Without any obligation, send me your Free Book, "Opportunities in the Airplane Industry," also information about your Course in Practical Aeronautics

Name .....

Street .....

City ..... Sta

Digitized by Google

Original from UNIVERSITY OF CHICAGO

Mechanical Engineering

Learn at Home!

Employers are looking for men with mechanical ability.

There is an easy, delightful way in which you can learn right at home in spare time. For 32 years the International Correspondence Schools have been giving men and women just the training they need for success in mechanical engineering and more than 300 other subjects. Hundreds of thousands have stepped into good positions through I. C. S. help.

Let the I. C. S. help *you*. Choose the work you like best in the coupon below, then mark and mail it today. This doesn't obligate you in the least but it will bring you information that will start you on a successful career. This is your chance. Mark and mail the coupon *now*.

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6218-C, Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject *before* which I have marked an X:

BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Industrial Management
- ☐ Personnel Organization
- ☐ Traffic Management
- ☐ Business Law
- ☐ Banking and Banking Law
- ☐ Accountancy (including C.P.A.)
- ☐ Cost Accounting
- ☐ Bookkeeping
- ☐ Private Secretary
- ☐ Spanish ☐ French
- ☐ Salesmanship
- ☐ Advertising
- ☐ Better Letters
- ☐ Show Card Lettering
- ☐ Stenography and Typing
- ☐ Business English
- ☐ Civil Service
- ☐ Railway Mail Clerk
- ☐ Common School Subjects
- ☐ High School Subjects
- ☐ Illustrating

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Electrical Engineering
- ☐ Electric Lighting
- ☐ Mechanical Engineer
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Railroad Positions
- ☐ Gas Engine Operating
- ☐ Civil Engineer
- ☐ Surveying and Mapping
- ☐ Metallurgy ☐ Mining
- ☐ Steam Engineering ☐ Radio
- ☐ Architect
- ☐ Blue Print Reading
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ Chemistry ☐ Pharmacy
- ☐ Automobile Work
- ☐ Airplane Engines
- ☐ Agriculture and Poultry
- ☐ Mathematics

Name.....

Street Address..... 8-3-23

City..... State.....

Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

$4.00 ADDING MACHINE

The GILSON ADDER will do your figuring easily, quickly and with absolute accuracy. It adds, subtracts, multiplies and divides and automatically carries from one column to the next. Capacity 109,999,999 or $1,099,999.99. Size 3½"x8"x1¼". Made with aluminum case and steel operating parts. Written Two-Year Guarantee. Catalogue free.

Price, postpaid, $4.00
Your money back if you are not satisfied.

GILSON SLIDE RULE CO., NILES, MICH.

MUSIC LESSONS FREE

music like this quickly!

today for our FREE booklet. ano, Organ, Violin, Mandolin, rs or advanced players. Your y for music and postage used.

C, 57 Lakeside Bldg., Chicago

Correct Postures for Various Workers

(*Continued from page* 916)

Aside from foot rests, one of the most important things to the worker who is forced to sit in one place in more or less the same position for a whole day at a time, is a back support of some kind. Where there is no back rest and the feet are forced to hang without touching the floor more fatigue may result from sitting all day than from standing. Aside from the tiring effect of the position it has a tendency to form a curvature in the body that causes cramping of the upper organs on the diaphragm and the digestive tract.

One of the most advisable arrangements that can be made for the health of the workers is to arrange the benches or work tables so that they may be used either in the sitting or the standing position. Above is shown such a desk fitted to the proper height and supplied with the proper foot rest. The stool, it will be noticed, also has a convenient back rest. This is the best design for certain office and laboratory or shop furniture. It will cause the minimum of fatigue.

When workers are forced to sit in cramped positions it is best to change the nature of their work at short intervals and to change it in such a way that each succeeding position will tend to rectify the effects of the previous one. For instance, if the worker is required to lean forward on one piece of work, it should be arranged so that she may stand more or less straight at the next one. Also there should be frequent rest periods in the day's routine.

YOU TOO CAN PLAY THE HAWAIIAN GUITAR

JUST AS THE HAWAIIANS DO!
PLAY ALL THE LATEST HITS

After Your FIRST LESSON You Will Play a Complete Selection. We Guarantee That--

Our method is so simple, interesting and appealing that you begin in your first lesson to learn the famous Hawaiian Folk Song "ALOHA". Think how happy you will be when you surprise your friends by playing the fascinating Hawaiian Guitar.

Only Four Motions--and You Master Them Quickly!

In a few minutes you acquire the four motions necessary to play any piece--after that a short period of practice and you will have mastered this weirdly sweet music. Complete course of 52 lessons includes FREE beautiful Hawaiian Guitar, necessary picks, steel bar, etc. No extras.

No Previous Musical Knowledge Necessary

If you *never read a musical note in your life*--if you haven't even the slightest knowledge of music, we can quickly and positively teach you to play this wonderfully popular instrument. Don't be just a "listener" when you can *easily be the center of interest* among your friends. Over 40,000 successful students.

Just Mail a Post Card for Details of our remarkable FREE Hawaiian Guitar Offer--simply write: "I am interested"--*but do it today.*

First Hawaiian Conservatory of Music, Inc.
Desk 40 --233B'dway (Woolworth Bldg.)
New York City

Special courses on Violin, Tenor-Banjo, Banjo--Ukulele and Ukulele.

FREE A Beautiful Hawaiian Guitar

VACCU-PUMPS

Needed by every Doctor, Dentist, Chemist, Mechanic, garage repair shop, radio experimenter, college and laboratory.

Many Uses

Will exhaust vacuum tubes, start a syphon, empty auto gas tanks by suction, draw liquid from inaccessable places, transfer acids, and supply a vacuum for any medical or laboratory use. Price with gauge, hose, and bottle, $10.00. Without gauge, $6.00. Circulars on request.

A. B. C. LABORATORIES CO.
100 Lawrence St., N. Y.
West 126th St.

Develop Your Ideas At Home

With a Boice Junior Bench Saw

Do your ripping, mitering, grooving, rabbetting, tenoning, sanding, grinding, and many other operations with surprising ease and accuracy. Top 10"x13". Saws 1¼" stock. Dadoes ⅝"x⅝". Machine built entirely of metal. Driven by ¾ or 1/3 hp. motor. Portable. Attaches to any light socket. Extremely accurate. Write for descriptive literature on Boice-Built Bench Saws, lathes, drills, jointers, band saws, and motors.

W. & J. Boice, Dept. S.I.I 1730 Norwood Ave., **Toledo, Ohio**

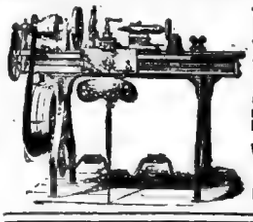
BE AN EXPERT REPAIRMAN On MOTORS and GENERATORS

Repair and Maintenance Men Are in Big Demand.

LEARN IN 3 MONTHS

Insure yourself permanent income and bigger opportunities—here at this Great Electrical School you actually wind D.C and A.C. armatures under expert instructors. 72-page Book. It's Free. Write for it today.

SCHOOL of ENGINEERING of MILWAUKEE
S.&I.-124A 415-17 Marshall St., Milwaukee, Wis.



LATHES

9 to 18-inch Swing

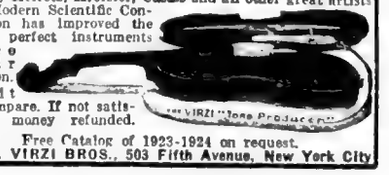
List price $135.00 and up, according to size. When ready to buy, send for Lathe Catalog and prices.

W. F. & John Barnes Co,
442 Ruby Street
ROCKFORD, ILLINOIS

The Tone and Quality Long Looked For

Used by Heifetz, Kreisler, Casals and all other great artists

This Modern Scientific Construction has improved the almost perfect instruments since their Creation.



Try it and compare. If not satisfactory money refunded.

Free Catalog of 1923-1924 on request.

J. & J. VIRZI BROS., 503 Fifth Avenue, New York City

Digitized by Google Original from UNIVERSITY OF CHICAGO

Answers to Scientific Puzzles

(*Continued from page* 880)

THE DRUGGIST'S BALANCE

A NUMERICAL example will perhaps illustrate most clearly the effect of inequality in length of the arms of a beam or platform balance. Suppose for simplicity that one arm is 12 inches long and the other only 6 and that the druggist wants to weigh out 10 oz. of material. If he places a ten ounce weight on the long arm of the balance he will have to counter-balance it with 20 oz. of material which he will sell for the price of 10 oz. But if he places the weight on the short arm he will have to balance it with only 5 oz. of material which again he will sell for the price of 10 oz. On the average, then, he will dispense 25 oz. of material at the price of 20 oz. which means a constant loss on account of the imperfection in the balance.

A QUESTION OF ELASTICITY

In general a glass ball will bound much better than a rubber ball provided of course that the former does not chip or break in the process. This is because glass, contrary to common opinion, is far *more elastic* than rubber. By *elasticity*, it should be remembered, we do not mean stretchableness, for in that sense taffy would be very elastic indeed. To be elastic a body must have a tendency to recover its original shape quickly after being distorted, in which sense glass is surprisingly elastic notwithstanding its great brittleness which sometimes gives us a contrary impression.

THE PROBLEM OF THE SWIMMERS

Let V be the speed of swimmers in still water,

V_1 the speed of the stream,

and D the distance to the turning point.

Then the speed of the swimmer going downstream is $V + V_1$ and his speed upstream $V - V_1$. The time required to make the complete trip downstream and back will be

$$t_1 = \frac{D}{V + V_1} + \frac{D}{V - V_1} = \frac{DV - DV_1 + DV + DV_1}{V^2 - V_1^2} = \frac{2DV}{V^2 - V_1^2}$$

The other swimmer, who swims across the stream, makes the same speed both ways, but his net speed is not equal to that in still water, for he must constantly swim upstream a little to avoid being carried down by the current. Adopting the notation used above, the speed of the swimmer going across the current will be $V_2 = \sqrt{V^2 - V_1^2}$, and the time required to make the complete trip will be $t_2 = \frac{2D}{\sqrt{V^2 - V_1^2}}$

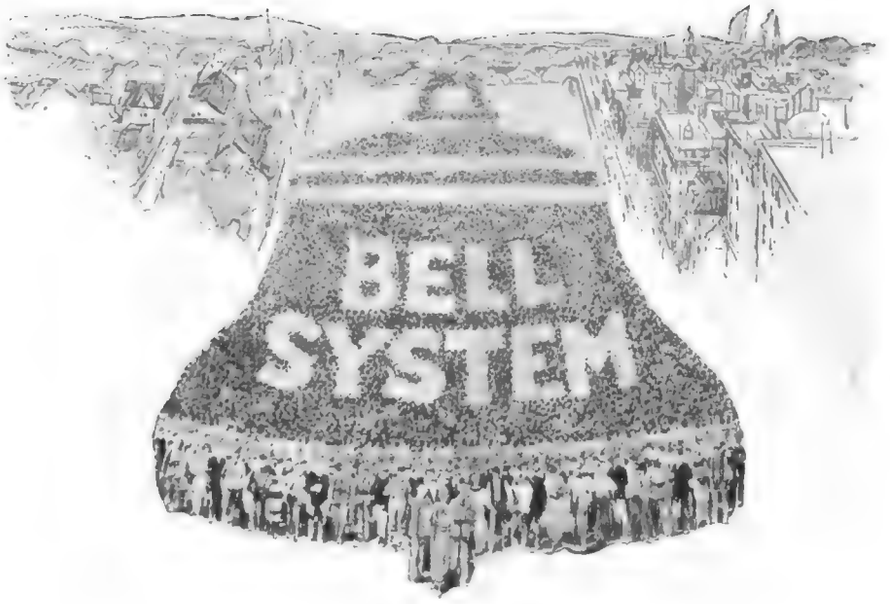
On dividing the expression for t_1 by the expression for t_2 we see that

$$\frac{t_1}{t_2} = \frac{\frac{2DV}{V^2 - V_1^2}}{\frac{2D}{\sqrt{V^2 - V_1^2}}} = \frac{V}{\sqrt{V^2 - V_1^2}}$$

From an inspection of this last equation it is apparent that the denominator of the right hand number is less than the numerator for any positive value of V_1, the velocity of the stream. Hence t_2 is less than t_1 which indicates that the swimmer going across the stream should win the race.

WEIGHING THE COAL

The answer to this problem depends upon whether the platform of the scales was above the level of the ground, on the level of the ground, or below the level of the ground when two of the wheels of the wagon were



Giving the Telephone Life

Wherever your thought goes your voice may go. You can talk across the continent as if face to face. Your telephone is the latch to open for you any door in the land.

There is the web of wires. The many switchboards. The maze of apparatus. The millions of telephones. All are parts of a country-wide mechanism for far-speaking. The equipment has cost over 2 billion dollars, but more than equipment is needed.

There must be the guardians of the wires to keep them vital with speech-carrying electrical currents. There must be those who watch the myriads of tiny switchboard lights and answer your commands. There must be technicians of every sort to construct, repair and operate.

A quarter of a million men and women are united to give nation-wide telephone service. With their brains and hands they make the Bell System live.

"BELL SYSTEM"

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

AND ASSOCIATED COMPANIES

One Policy, One System, Universal Service and all directed toward Better Service

WHY SPEND MONEY TO GO TO A TRADE SCHOOL?

Train with a real company that will use you when your training is finished. Here's a company that will train you; put you in one of their shops for practical experience and go into business with you after you finish. Some day we are going to control the Automobile Electrical Service game and are training men for our own use.
Will you be with us? For information write to

MOTOR CAR IGNITION CO., Inc. CENTRAL DIVISION, Dept. 206
5036-38 W. 25th St., Cicero, Chicago, Ill.

Automobile Electrical Service—Coast to Coast

Insure your copy reaching you each month. Subscribe to SCIENCE & INVENTION—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Digitized by Google

Original from UNIVERSITY OF CHICAGO

$3 DOWN brings genuine

UNDERWOOD

Yes, only $3 down puts this genuine standard Shipman-Ward Rebuilt Underwood in your home. Then—small monthly payments, or if convenient, pay cash. Either way you get the *world's standard* typewriter at a big cash saving.

WHY PAY RENTAL?

Think of it! You pay little more than rental, and the machine is yours! We offer the same three models of the Underwood Typewriter which are being made and sold by the Underwood Company today. The only difference is that Shipman-Ward machines are priced lower and are rebuilt like new by experts. You can't tell them from brand new machines. Visible writing—the FULL LINE of typewriting is visible at all times. STANDARD 4-ROW SINGLE SHIFT KEYBOARD. Two color ribbon, back spacer, stencil device, automatic ribbon reverse, tabulator, etc.

TEN DAYS' FREE TRIAL

See for yourself! Try the typewriter ten days. You must be satisfied or the entire transaction won't cost you a penny. Act today. Get our big illustrated catalog and full particulars. Write NOW.

FREE TRIAL COUPON

Typewriter Emporium
SHIPMAN-WARD MFG. CO.
2161 Shipman Bldg., CHICAGO

Send by return mail Bargain Offer No. 2161 of a Standard Visible Writing Underwood. This is not an order and does not obligate me to buy.

Name.....

Street or R.F.D. No.....

Postoffice..... State.....

DANCE And be Popular

Learn In ONE HOUR at Home

There's now no need of being a wallflower. In one hour—at home—by mail—I can make you an easy, confident dancer—popular in any ballroom.

NEW EASY METHOD

No Partner Needed—No Embarrassment

Over 60,000 men and women have become popular dancers of Fox Trot, One Step, Waltz and all the latest up-to-the-minute society dance steps through my new Foto-tell and Foto-tell Method set to music. Amazingly easy—fascinating. No other course like it. I teach you perfect time and rhythm—the secret of good dancing. Your success Guaranteed.

SENT FREE ON TRIAL —No Deposit

Convince yourself at my expense how amazingly easy it is to learn modern dancing with my new method. For a short time only I'll send the first six lessons of my course (in plain wrapper), including 10 inch dance instruction record, free and prepaid for five days trial. See, test and prove this remarkable new method in your own home. Then, if not delighted at your success, simply return record and lessons within five days and you'll owe me nothing. Write quick before this unusual offer expires. Please mention make of phonograph you have.

WILLIAM CHANDLER PEAK, M. B.
Studio 241
4601-4611 Broadway Chicago, Ill.

Send To-day for the

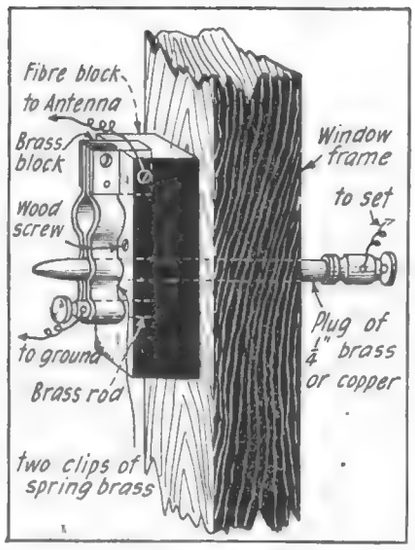
"Electrical Worker's Friend"

An electrical book of 66 motor drawings with complete instructions for rewinding and connecting A. C. motors. Special ... $3.00

... particulars of this valuable book.

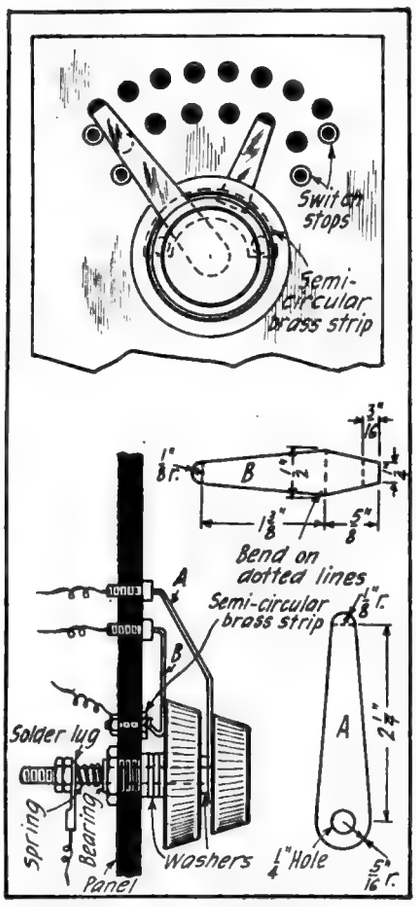
...ITH PUBLISHING CO.
...itage St., Pittsburgh, Pa.

Unique Lightning Switch



If a hole is drilled in a window frame and through a fibre block screwed to the outside of the frame, and other material arranged as shown above, an efficient lightning protection device will be formed. Two heavy spring brass clips are so bent that they may be mounted as shown. A plug is then made which can be passed through the hole in the frame and the fibre block and which will separate the two clips so that they will not touch the binding post which is connected to the ground. When the plug is withdrawn the clips close and clasp the binding post and the antenna is grounded. With the plug inserted, the antenna is connected directly to the receiving set.—David Kennedy.

Compact Double Switch



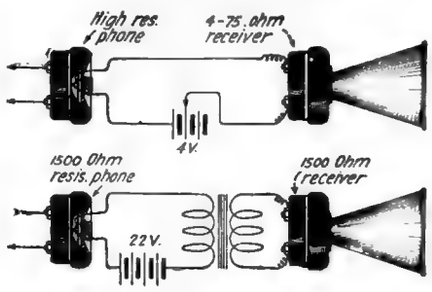
The units and tens switch on a variocoupler can be combined into one unit by following the data given above. The details of the two switch arms are given at A and B and the assembly is made as shown. A front view of the completed switch will be seen at the top of the above illustration. The short arm makes contact both with a row of switch points and with a semi-circular brass strip which completes the circuit. The circuit of the long arm is completed through the mounting. Arm B is fastened to the large knob so that it is insulated from the shaft.—Einar I. Rand.

How to Hook-Up A Transmitter Button to Make an Efficient Loud Talker

A Transmitter button with a few dry cells and a telephone receiver will make a remarkably simple and efficient loud talker. A Microphonic amplifier of this type is just the thing for use with a radio set. The weak music and signals may be amplified many times their original value. It is possible to entertain a large audience with a simple radio equipment if a transmitter button is used in the circuit as explained in diagram A.

The cost is extremely low and the results are comparable with those produced by highest grade of expensive loud talkers.

As may be seen in the diagram, two dry cells or a small storage battery are connected in series with the transmitter button and a 4 to 75 ohm telephone receiver. The transmitter button is secured to the diaphragm of the telephone in the radio receiving set. To accomplish this properly, scrape off the enamel (if diaphragm is enameled) on the face of the diaphragm and solder the small hexagon nut supplied with the button to the exact center. Care should be taken that the thin diaphragm is not bent or otherwise



harmed. The transmitter button is then screwed into place. Connections, as shown in the diagram, are made with flexible wire. A horn may be placed over the low resistance receiver if desired. When the radio set is properly tuned and signals are being received, the transmitter button is operated by the vibration of the diaphragm of the receiver. As the receiver diaphragm vibrates, the mica diaphragm on the transmitter button also vibrates. The carbon grains are compressed at varying pressure; the current flowing through the local battery circuit is thus varied and results in an amplification of the sounds in the low resistance telephone loud-talker.

Diagram B, which includes a step-up transformer, is to be used with loud talking receivers of high resistance. The primary of the transformers should have a resistance of about 75 ohms. An ordinary telephone induction coil will serve as the transformer in this circuit.

You can get the above-described transmitter button FREE in subscribing to "Practical Electrics Magazine" at $2.00 per year (12 months). Send your subscriptions today.

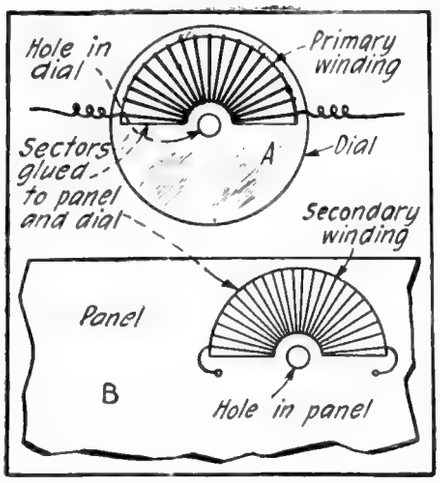
Make all remittances payable to Practical Electrics Co., 53 Park Place, New York City.

—Adv.

Digitized by Google

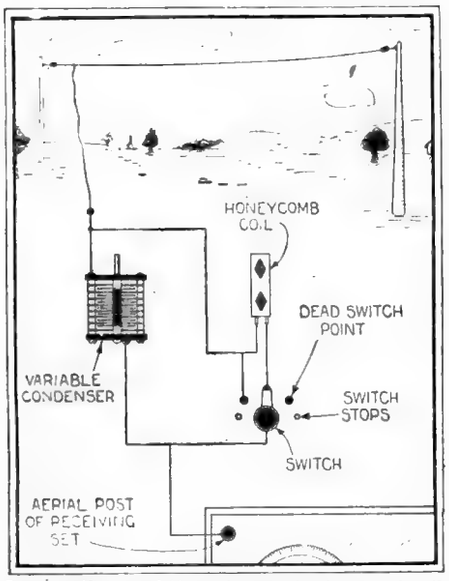
Original from UNIVERSITY OF CHICAGO

A Novel Tuner



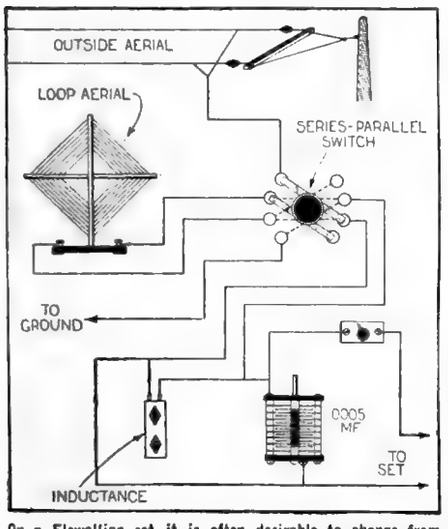
By winding two coils on cardboard sectors and mounting as illustrated above, a serviceable and compact tuner will result. It may be connected either as a variometer or variocoupler as desired.—Walter Ridgwell.

Wave-Trap or Series Condenser



By connecting a variable condenser and a honey-comb coil with a three point switch as illustrated above, either a series variable condenser or a wave-trap may be used in series with the antenna or the latter may be connected directly to the set.—Philip M. Zimmerman.

Switch for Flewelling Circuit



On a Flewelling set it is often desirable to change from aerial to loop or to ground alone. This may be accomplished by means of a series parallel switch. All the connections are shown above.—Arthur Landman.

Generations of travelers in Europe have seen women washing clothes, like the woman in this illustration, on the banks of rivers.

Shall the river work— or shall you?

Too many women, abroad, are still washing clothes like this.

They go to the river. Our American rivers are being trained to come to *us*. Water-wheels drive electric generators—thus water is supplied to your home, and electric current runs the washing machine which has banished so much toil.

Back of every great step in woman's progress from a drudge to a free citizen has been some labor-saving invention. Back of most inventions in electricity's progress from a mystery to a utility has been the research of General Electric Company scientists and engineers.

GENERAL ELECTRIC

LEARN RADIO

Here's your opportunity. Radio needs you. Win success in this fascinating field. Trained men in demand at highest salaries. Learn at home, in your spare time.

Be a Radio Expert

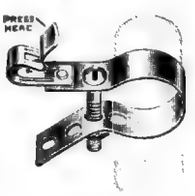
I will train you, quickly and easily, to design, construct, install, operate, repair, maintain, and sell all forms of Radio apparatus. My new methods are the most successful in existence. Learn to earn

$1,800 to $10,000 a Year

FREE Wonderful, home-construction, tube receiving set, of latest design. Write for "Radio Facts" free. Engineer Mohaupt.

American Electrical Association
Dept. 61 4513 Ravenswood Ave., Chicago

IMPROVED GROUND CLAMP



Equipped with Fahnestock Patent Wire Connectors Easily Attached

No Soldering—For Radio Use Only

AT YOUR DEALERS.

FAHNESTOCK ELEC. CO.
Long Island City, N. Y.

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

—and Now a Complete Radio Receiving Set

Consisting of

Radiogem Phone and Aerial **$2.50**

Shipping Charges Prepaid to Any Point in the U. S.

This outfit is absolutely complete. It includes everything you need to hear the Broadcast Programs, market reports, time signals, ship calls or land station messages. Nothing more to buy—no batteries or tubes needed—no upkeep cost of any kind.

$2.50 Complete

$1.00 Without Phone or Aerial

(Patents Pending)

The Complete Outfit Consists of Three Parts

(One)

The RADIOGEM

The simplest radio outfit made—yet as practical as the most expensive. A crystal receiving set that you can operate and enjoy even though you know absolutely nothing about radio. You receive the RADIOGEM unassembled, together with a clearly written instruction book, which shows you how to quickly and easily construct the set, using only your hands and a scissors. The outfit comprises all the necessary wire, contact points, detector mineral, tube on which to wind the coil, etc., etc. The instruction book explains simply and completely the principles of radio and its graphic illustrations make the assembling of the RADIOGEM real fun.

(Two)

The GEMPHONE

An adjustable, 1,000-ohm phone complete with 3-ft. cord—the first inexpensive adjustable receiver made. The Gemphone is of standard type and made of the very best grade of materials throughout. The case is made of turned wood, an exclusive feature with the "GEMPHONE." This is responsible for its exceptionally rich, and mellow tone. Like RADIOGEM, the GEMPHONE is sold unassembled. Our Instruction pamphlet shows how to assemble it in two minutes, using only a screw driver.

(Three)

The AERIAL OUTFIT

Consisting of 100 ft. of standard copper aerial wire and two porcelain insulators.

Complete Radiogem Outfit	$ 2.50
The Radiogem, only	1.00
The Gemphone, only	1.00
Aerial Outfit, only	.50

What They Say About RADIOGEM

I am enclosing herewith $1.00 to pay for the Radiogem. I had it carefully wound by our wireless operator and find that it works beautifully—fully as good as any crystal set we know of.

Radiogem received, which we assembled and were very much astonished at results obtained and the clearness and volume of tone produced.

The greatest distance I heard on one of your sets is 1000 miles, having heard WGY at Schenectady, N. Y. I think your set is the best I have ever sold at any price.

Herewith P.O.M.O. amt. $1.00 for another "RADIOGEM." The one received is O.K. Placed about 15 ft. of picture cord under front porch and grounded to a gas meter, and heard the Sacramento Bee and Sacramento Broadcasting Union much better than with my large crystal set.

Your RADIOGEM RECEIVER is a wonder. I have received every station in Philadelphia with it much louder than with a high-priced crystal set.

Your two Radiogem sets received last night, and one was wired up for testing. WOC is about 40 miles away, and their signals could be heard with headphones on table. After they quit KYW at Chicago about 170 miles east was heard. Every word could be plainly heard here.

You claim a radius of 20 miles over your "Radiogem" is sometimes a possibility. You should adhere to the truth. I constructed one for my mother, installed it with an aerial, and she listens not once in a while, but at her will, to Schenectady, Newark, New York, or Providence, R. I., and her home is Attleboro, Mass. I can't give your set too much praise.

(Names and Addresses on Request)

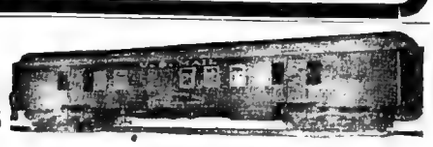
Order Direct or From the Following Dealers:

Akron, Ohio
Federman's Dept. Store
Astoria, Ore.
Cook & Foster
Atlanta, Ga.
Miller's Dollar Store
Baltimore, Md.
A. A. A. A. Co.
Boston, Mass.
Radio Specialty Co.
Brooklyn, N. Y.
Levy Brothers
Weber Talking Mach. Co.
Buffalo, N. Y.
Elec. Sup. & Equip. Co.
Chicago, Ill.
Barawik Co.
Home Supply Co.
Levitus & Flansburg
Cleveland, Ohio
Anderson Elec. Co.
Service Publishing Co.
Dallas, Texas
Cullum & Boren Co.
Texas Furniture & Storage Co.
Freeport, L. I.
Alexander Gold
Hamilton, Ont., Canada
Radio Supply Co.,
Hartford, Conn.
Sage Allen Co.
Hawera, New Zealand
H. H. Blake
Havana, Cuba
Compania Radiotelefonica de Cuba
M. Massana
Manuel Nodar, Jr.
Radio Novelty
Hoboken, N. J.
C. R. Prieman Co.
Laurel Springs, N. J.
Stone & Kean
Los Angeles, Cal.
Lester's Radio Shoppe
Medford, Ore.
Virgins Radio Service
Media, Pa.
Media Elec. Co.
Melbourne, Australia
Marks&Abrahams,Pty,Ltd.
Newark, N. J.
L. Bamberger & Co.
New York City, N. Y.
Dixie Supply Co.
Eastern Radio Corp.
Radio Specialty Co.
Harold M. Schwab
Northampton, Mass.
Parsons Elec. Shop
Norfolk, Va.
F. J. Sawyer
Oregon City, Ore.
Singer Hill Radio Service
Philadelphia, Pa.
Jos. J. Miller
Philipsburg, Pa.
A. O. Curtis
Poughkeepsie, N. Y.
Chas. P. Raymond
Providence, R. I.
The Outlet Co.
Pullman, Wash.
Electric Supply Store
Saginaw, Mich.
J. A. Loubert & Co.
St. Louis, Mo.
United Auto Supply Co.
St. Paul, Minn.
Hill District Radio Sheet Metal Co.
Seattle, Wash.
Frank B. Wilson
Springfield, Mass.
Johnsons Book Store
Washington, D. C.
Chas. Klaben Co.

THE RADIOGEM CORP., 66-S-West B'way, N. Y. City

WANTED

Railway Postal Clerks



$1600 to $2300 Year

MEN—BOYS 18 Up

Mail Coupon Immediately

Steady work. No layoffs. Paid vacations.
Common education sufficient.
Travel — See the country.

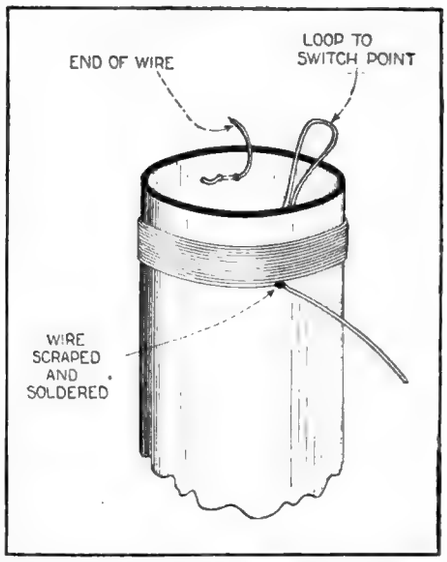
COUPON

Franklin Institute, Dept. E182, Rochester, N. Y.
Sirs: Send me without charge, (1) Sample Railway Postal Clerk Examination questions. (2) List of Government jobs now obtainable. (3) Send free illustrated book, "How to Get Government Jobs."

Name .....

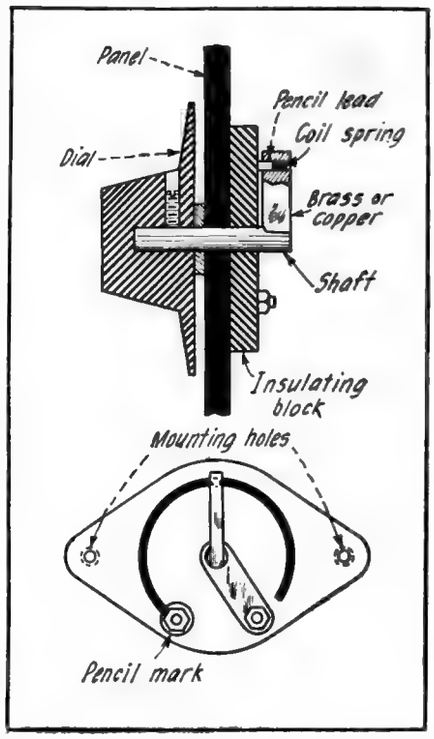
Address .....

Tapping Coils



In tapping a coil it is usually common practice to make a small loop in the wire and twist it slightly and continue with the winding. However, when coils are used which do not have any parts within them, a much neater job will result if the taps are taken off as illustrated above. Holes should be drilled in the tube at the points where taps are to be taken off. The wire is then wound and when a hole is reached, a loop about five or more inches long is made in the wire and pushed through the hole. At the point where the wires enter the hole, the insulation should be scraped and the two points soldered. The end of the loop is then freed from insulation and soldered to the switch point. A kink for fastening the end of the wire is also given above. Three holes are drilled in the tube and the wire laced in and out through them so that it will hold itself. —Maynard J. Columbe.

An Efficient Grid Leak



An efficient variable grid leak is one of the most elusive of instruments and very seldom can be made to function properly. However, by following the constructional details given above, a variable grid leak will result which will have very few of the drawbacks of the average type and many advantages. One of the greatest advantages is that it renews itself by placing carbon on the line which forms the high resistance instead of scraping it away, as is done by the usual type of contact. —T. L. Stalker.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Make Money Taking PICTURES

Tremendous, big-paying opportunities are open for ambitious men in Modern Photography. This is the picture age. Magazine and newspaper publishers buy thousands of photographs each year. Every manufacturer sends out high priced pictures of his products. Every home wants portraits. Photography is a business running into millions of dollars each year. And there is a great shortage of trained photographers.

Get $100 for Flood Pictures
"I took pictures of a flood and sold them for $100. I have been able to buy my house and lot from the sale of pictures."
C. M. Cole, Washington.

$97 in Two Days!
"I made $285 in December. Went out two days last week on home portrait work and made $97."
A. G. Hughes, Kentucky.

EARN $3,000 to 10,000 a Year

Hundreds of men are earning big money and establishing their own businesses. Even during spare time, while training, you can make $75 a week easily—no matter where you live!

Amazing New Easy Method

I show you, at home, how to do the kind of work turned out by the big studios in New York and Chicago! I show you how to make big money within 30 days! C. M. Cole bought a home with money he had made when only half way through his training. So well do I know what I can do for you that I guarantee under bond to return every cent of your tuition if you are not thoroughly satisfied.

Professional View Camera FREE!

Write at once for Free Camera Offer—I give you, free, a splendid professional view camera. You will be astonished and delighted. This offer open for short time only—so act quick! No obligation.

INTERNATIONAL STUDIOS, Inc.
Dept. 7451
3601 Michigan Ave., Chicago, U.S.A.

COAST TO COAST ON ONE TUBE

E. MacDonald of Bangor, Me., heard KZV, Wenatchee, Wash., on the

ROYAL Portable Broadcast Receiver

The best—yet simplest set made. One dial controls everything. Endorsed by Tribune Institute. Uses an ordinary dry cell battery. Takes all wave lengths.

$10.00

Royal Portable Receiver complete with phones, tube and aerial $19.75
Royal 2 stage amplifier; best type of amplification for our 1 tube set 17.50
Royal Wave Trap, improves considerably the selectivity and reception of any set 6.00

Get our catalog of Standard Radio Parts

ROYAL MANUFACTURING COMPANY
Dept. 27 World Building, N. Y.

"B" BATTERIES

$1.75—22½ v. ..... $ .80
$3.00—22½ v. Large 1.35
$3.00—45 v. 1.30
$4.00—45 v. 1.75
$5.50—45 v. 2.75

STORAGE BATTERIES

$18.00—60 Ampere Hours $9.75
$24.00—100 Ampere Hours $12.75
$28.00—120 Ampere Hours $14.75

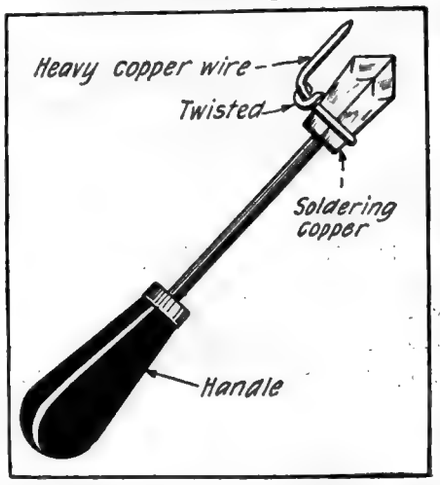
Set of 3 Neutrodyne Transformers with Neutralising Condenser ... $14.75
$5 Geid Aerial 7 Str. $2.50
$25 Loud Speaker $12.50
$30 Musetone $16.

WEBSTER RADIO SHOP 45 VESEY ST. NEW YORK

Dr. Seibt 6000 Ohm Phones $5.75
Baldwin Single Phones $4.25
Reinartz Coil, 700 meters $1.45
75c Sockets ..... $ .30
$3.00—180° Coupler, 700 meters 1.48
$8.00—Audio Transformers, 10 to 1 ratio.. 4.25
$6.50—1½ Volt Tube 2.95
Indoor Aerials ..... .85
Three Tube Set—Guar. All Distances 40.00
One Tube Set—Operating Loud Speaker 22.00

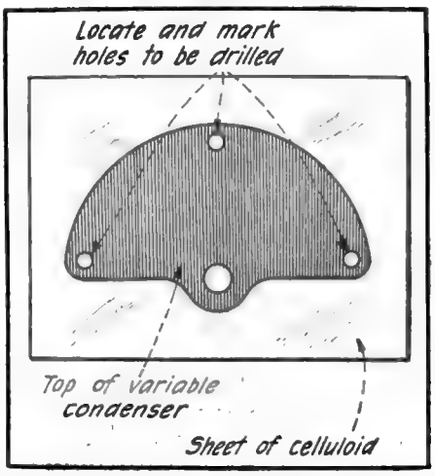
SEND FOR SPECIAL XMAS BARGAIN LIST

Useful Soldering Kink



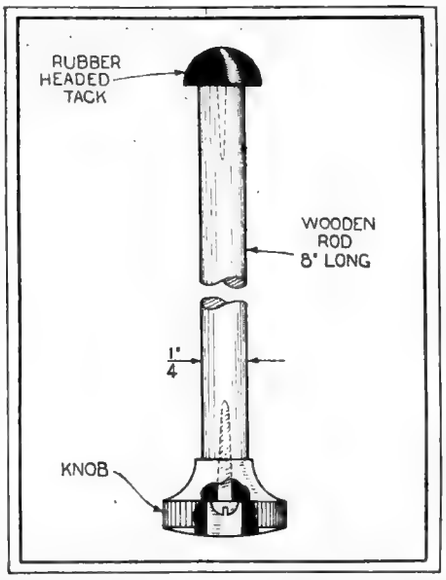
The average soldering iron used by the amateur is much to heavy for fine work. If a piece of copper wire is twisted around the iron and pointed at one end a useful appliance for small work will be formed. The wire may be of any length necessary to do the work on hand and the heavy soldering copper will keep it hot.—E. Rosewater.

Easily Made Template



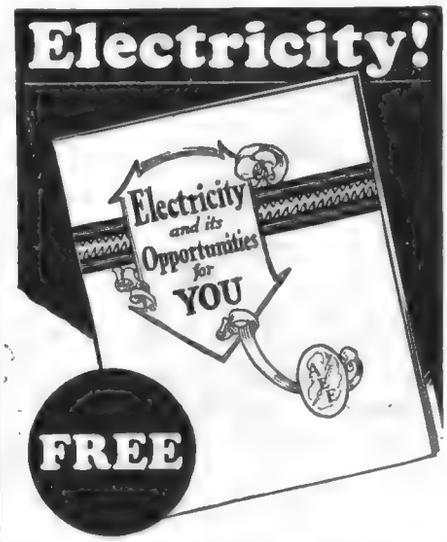
A sheet of celluloid may be laid over the top of a variable condenser and the locations of the various holes to be drilled marked thereon. The holes are then drilled in the celluloid and a template will result which will give very good results for locating the mounting holes for the condenser on the panel. —E. M. Abbot.

Vernier Rod



A rod constructed as shown above may be used for turning the dials on a receiving set by placing a rubber headed tack on the panel in frictional contact with the edge of the dial. —Edward L. Foote.

Electricity!



Send for YOUR Copy of this Great Book Now

THIS handsome, profusely illustrated book will tell you of the astonishing growth of the great Electrical Industry, and of the thousands of big money jobs and opportunities waiting for trained men.

More important, it will tell you of the great Associated Electrical Engineers—chartered by the State of Illinois, as an institution for the advancement of every phase of Electrical Science. Not a mere school, but a great National Organization of Electrical Experts and Specialists, who have developed the MOST REMARKABLE SYSTEM ON EARTH for HOME TRAINING IN ELECTRICITY.

We Train You at Home
in your spare time, quickly and surely, by our EXCLUSIVE AND COPYRIGHTED METHOD to qualify to

Earn $75 to $200 a Week
as an Electrical Expert or in business for yourself—and

We Help You "Cash In"
through our Placement Department and our great FREE BUSINESS COURSE, which will show you how to get the big-money Electrical jobs and how to establish your own independent Electrical business.

Our Book Tells the Story
Our BIG 64-PAGE ILLUSTRATED BOOK will tell you fully about every one of the 9 remarkable features of Associated Electrical Engineers Service, and how they will be the stepping stones for you from futureless, low-pay jobs up into the limitless big-money opportunities in Electricity.

Mail the Coupon NOW
Get this remarkable book. It is FREE. You will incur no obligation in asking for it. We want every ambitious man in America to have one and receive this great message. Your copy is ready. Send for it TODAY.

Associated Electrical Engineers
Department C-14
537 South Dearborn St., CHICAGO, ILL.

Here's Opportunity's Wide Open Door

Associated Electrical Engineers
Department C-14
537 South Dearborn St., Chicago, Ill.

Without obligation, send me your 64-page illustrated book on Electricity, together with full details of your remarkable plan of home training and membership in the A. E. E.

Name.....

Address.....

ASSOCIATED ELECTRICAL ENGINEERS OF AMERICA

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Charge Your Radio or Auto Battery ~ *Overnight* for a nickel

Why be bothered with the inconvenience and expense of taking your storage battery to a service station every time it requires recharging? The

GOLD SEAL
HOMCHARGER
The World's Most Popular Battery Charger

charges any AUTO, RADIO or "B" storage battery in the *quickest, simplest* and *most efficient* manner possible. Connects to any lamp socket—operates silently—requires no watching. Fully automatic in operation—absolutely safe.

Beautifully finished in mahogany and gold. No danger from shock or fire—approved by Underwriters. UNQUALIFIEDLY GUARANTEED. Over 125,000 already in use.

Six-ampere size for *all* Radio, Auto and "B" storage batteries. Complete with ammeter—no extras to buy—$18.50 ($25.00 in Canada).

FREE. Ask your Dealer or write direct for free copy of Homcharger List of Broadcasting Stations, and Gold Seal Bulletin.

Insist on the GOLD SEAL — LOOK FOR IT

which appears on Nameplate and Package. No other charger is just as good!

GENUINE GOLD SEAL HOMCHARGER UNQUALIFIEDLY GUARANTEED

The Automatic Electrical Devices Co.
116 W. Third St., Cincinnati, Ohio, U. S. A.
Largest Manufacturers Vibrating Rectifiers in the World.

"TUNE IN" WITH ROSENDAL "B" BATTERIES

"TUNE IN" with a Rosendal and realize the full joy of Radio Broadcasting. See how clearly the signals will come in—how delightful the reception.

It is not how much you pay for a battery that determines its service. It is how good a battery you can get for the money that you pay. Rosendal batteries provide a happy combination of the two.

It is first of all, a dandy battery made of finest materials to give extra service. Rosendal Batteries don't stand around on dealer's shelves. They come to you direct from the manufacturer eliminating middleman's profit and that is the reason you pay so little for them. In addition to that every Rosendal Battery is guaranteed. It must either please you or you are entitled to your money back. Try a Rosendal once and you will be a steady user.

Send Money Order or Order C. O. D.

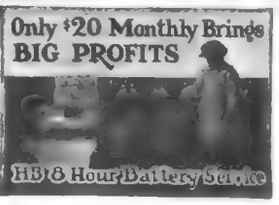
Shipment prepaid at the following direct to consumer prices.

	Large	Medium	Small
22½ Volt plain	$1.66	$1.33	$0.93
22½ Volt variable	1.84	1.50	1.00
45 Volt plain	3.33	2.33	—
45 Volt variable	3.66	2.66	—

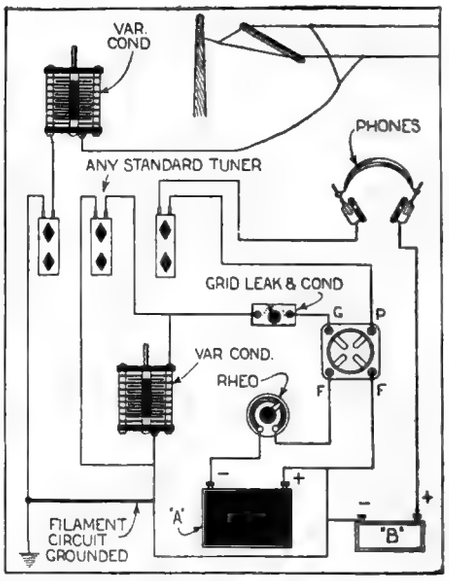
ROSENDAL & Co
Chemical and Radio Engineers
2 and 4 Stone Street New York

$300 PROFIT Monthly from HB 8 Hr. Battery Charging

That's what Rockford Battery Shop makes. Pauley, (Louisville), makes $200 monthly; W. B. Battery Co. (Montgomery) $250; Diamond Grid, (Asheville), $500; Scott & Archibald, (Oregon), $255. HB users make big monthly profits—you can, too. Only $20 Monthly Pays for HB 8 Hour Battery Charging. Small cash payment brings HB outfit on 30 days' trial with money-back guarantee. Your best winter money-maker. Write today for Bulletin 247.
HOBART BROS. CO., Box 81 TROY, OHIO
Pays For Itself ~ Earns Big Profits

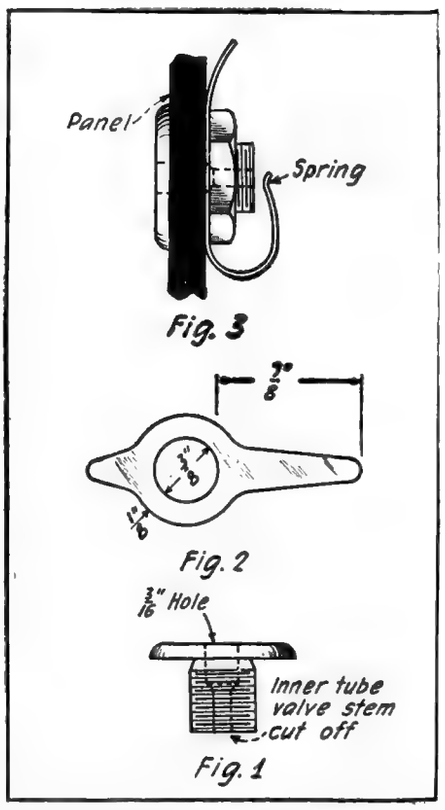


Reducing Body Capacity



One of the greatest annoyances to the average amateur is the effects of body capacity which are found when the hand is brought near the tuning controls. This is particularly annoying in tuning in DX stations. Sometimes even shielding of the panel will not eliminate the trouble. Under such conditions it is advisable to try the kink illustrated above wherein the filament circuit is grounded. This will very often eliminate trouble caused by body capacity, and make the set easier to tune. —Jack Kay.

Phone Tip Jacks



Phone tip jacks are rather expensive to purchase, but can readily be made by following the instructions given above. All the material required is the valve stem from an old automobile inner tube and a sheet of spring brass cut to the shape shown in Fig. 2. The valve stem is first cut off as shown in Fig. 1 and the hole enlarged for a distance of about one-quarter of an inch as shown. The strip of brass is then bent as illustrated in Fig. 3. The two parts are then mounted with a nut as illustrated. It will be found that the phone tip can be plugged into the hole and will make excellent contact with the spring brass strip. —Warren Fleener.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

We Teach COMMERCIAL ART

Meyer Both Company, the largest Commercial Art Organization in the World offers you an unusual opportunity for practical training, based upon twenty-three years of success. This nationally known organization each year produces and sells to advertisers over 15,000 commercial drawings. Meyer Both instruction is the difference between successful fact and experimental theory. This well paid profession equally open to men and women. Home study instruction.

Get Facts Before You Enroll in Any School

Ask the Advertising Manager of the leading newspapers in your city, anywhere in the United States, Canada, England or Australia about the Meyer Both Company—let them tell you about us. Write for our illustrated book telling about the success of our students—for one-half the cost of mailing—four cents in stamps

MEYER BOTH COMPANY
Department of Art Instruction
Michigan Ave. at 20th St., Dept. 64 CHICAGO, ILL.
Note—To Art and Engraving Firms: Secure practical artists among our graduates. Write us.

SEND NO MONEY FOR THESE AUTOMATICS

Lowest Prices in the Country

20 SHOT MILITARY MODEL 32 cal. with Extra Magazine FREE $8.45

25 Cal 6 SHOT BLUE STEEL .. $6.05
25 Cal 8 SHOT MAUSER $10.75
32 Cal 7 SHOT MAUSER $11.45

CYLINDER SWINGS OUT — Best Grade Made 6 SHOT HAND EJECTOR 32 Cal. $15.45 — 32-20 or 38 Cal. $16.45

32 or 38 Cal. Break-Open REVOLVER $8.25 — 6 SHOT Hand Ejector

LUGER GENUINE GERMAN 30 Cal. 9 SHOT $16.25 — 32, 32-20 or 38 Cal. Specially Reduced $13.45 — Brand New Guns Use Standard Ammunition

Satisfaction Guaranteed or Money Refunded
Pay Postman Our Price Plus Postage

EDWARDS IMPORT TRADING CORP.
258 BROADWAY Dept 941 NEW YORK CITY

BIG VALUE for 10 Cts.

6 Songs, words and music; 25 Pictures Pretty Girls; 40 Ways to Make Money; 1 Joke Book; 1 Book on Love; 1 Magic Book; 1 Book Letter Writing; 1 Dream Book and Fortune Teller; 1 Cook Book; 1 Base Ball Book, gives rules for games; 1 Toy Maker Book; Language of Flowers; 1 Morse Telegraph Alphabet; 12 Chemical Experiments; Magic Age Table; Great North Pole Game; 100 Conundrums; 8 Puzzles; 12 Games; 80 Verses for Autograph Albums. All the above by mail for **10 cts.** and **2 cts.** postage.
ROYAL SALES CO., Desk 166 South Norwalk, Conn.

FREE $20 Fine Tone Musical Instruments

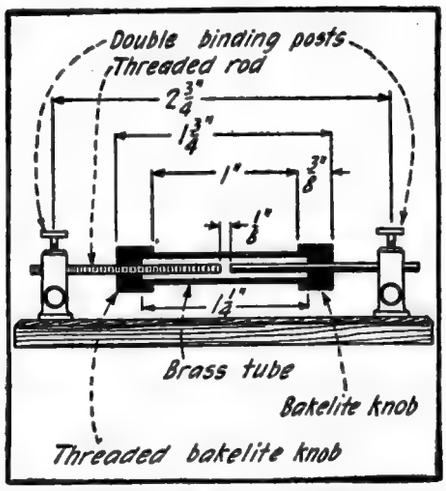
We have a wonderful new copyrighted system of teaching note music by mail! To first pupils in each locality we will give free a $20 superb Violin, Tenor Banjo, Ukulele, Hawaiian-Guitar, Banjo, Mandolin, Banjo-Ukulele, Banjo-Mandolin, Cornet or Banjo-Guitar absolutely free. Also teach Piano and Organ. Very small charge for lessons only. Four lessons will teach you several pieces. Over 100,000 successful players. We guarantee success or no charge. Complete outfit free. Write today. Dept. 149 No obligation.
Slingerland School of Music, 1815 Orchard St., Chicago, Ill.

DEAFNESS IS MISERY

I know because I was Deaf and had Head Noises for over 30 years. My invisible Antiseptic Ear Drums restored my hearing and stopped Head Noises, and will do it for you. They are Tiny Megaphones. Cannot be seen when worn. Effective when Deafness is caused by Catarrh or by Perforated, Partially or Wholly Destroyed Natural Drums. Easy to put in, easy to take out. Are "Unseen Comforts." Inexpensive. Write for Booklet and my sworn statement of how I recovered my hearing.

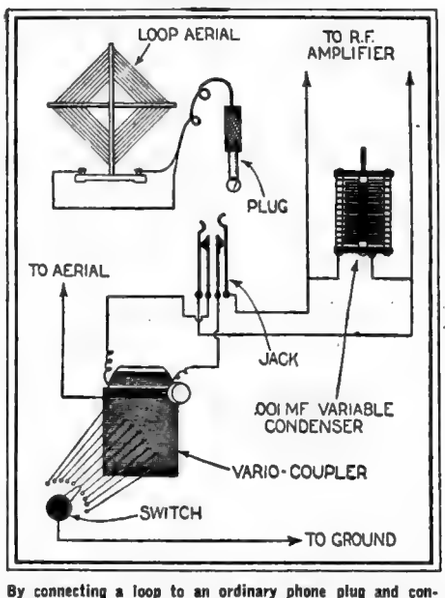
A. O. LEONARD
Suite 303, 70 5th Avenue — New York City

Neutralizing Condenser



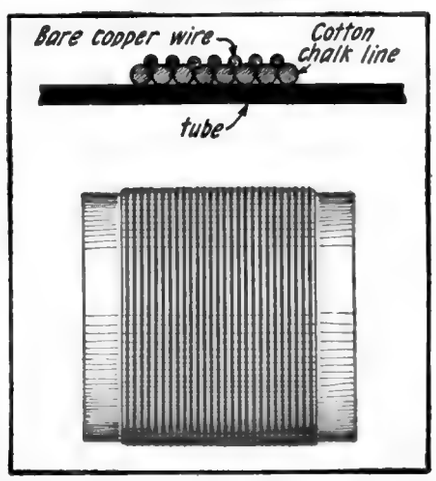
In the Neutrodyne circuit, very small capacities which can be critically adjusted must be used. By following the above diagram, a condenser results which will give good results and at the same time susceptible to close manipulation. —L. Kranzl.

Loop Connection



By connecting a loop to an ordinary phone plug and connecting a two-circuit jack as shown, either a loop or an outdoor antenna may be used as desired. Inserting the plug in the jack disconnects the antenna, ground and coupler and connects the loop in the circuit. —J. Phillyss.

Bare Wire Coils



Coils wound with bare wire are found to be very efficient in radio receiving sets, but spacing the turns is a rather tedious job. However, by first winding the coil with a layer of ordinary cotton cord and then winding the wire, an efficient coil will result in which the turns will be spaced very evenly. —A. Ferrand.

YOU CAN LEARN NEWSPAPER WORK

Experienced Editor Will Teach You How to Become a Reporter

FASCINATING WORK--GOOD PAY

Only a Few Months' Work Required To Qualify You for a Better Position

Regular reporters earn from $40 to $125 a week. Good deskmen on a daily paper are paid from $60 to $100 a week. A "Star" Reporter can command his own salary. Hundreds of ambitious men and women enhance their income materially by corresponding for newspapers or writing for magazines in their spare time.

We Will Teach You at Home

We can develop your talent for writing and lead you into this well paying profession. Our Practical Course in Journalism was personally prepared by Henry J. Brockmeyer, Assistant City Editor of the New York Evening Post. Mr. Brockmeyer has trained hundreds of men and women, many of whom have, under his guidance, developed into front rank reporters or feature writers.

Mr. Brockmeyer's course will teach you what it would take years of actual newspaper work to learn. It consists of six comprehensive lessons just brimful of everything a reporter must learn. The following are only a few of the subjects covered.

Starting in Journalism. What is a Newspaper? What is News? Start and Finish of a News Story. Technical Terms. The Type Point System. Styles of Type, Proof Reading. Capitalization and Punctuation. A Late Fire Bulletin. Court Stories. Libel Laws, Copyright. Hints to Reporters. Personal Conduct. Re-Writing and Condensing Stories. Paragraphs and Short Items. Good and Bad Styles. Broadening the Vocabulary. Aids to Good Style. Special Stories. Suggestions for Stories. Rhetoric. Preparing Your Story. Don'ts for Writers. Office Organization. Syndicated Matter. Business Office. Mechanical Department. Hints for Headline Writers. The Make-Up. The Country Correspondent, etc., etc.

This Complete Course For $10

The price for the entire course is only $10, and entitles the student to full consulting services which are directed by Mr. Brockmeyer personally, including any questions in connection with journalistic work.

Five Days' Trial

Just pin a check, money order or ten dollar bill to the coupon below and mail. Then take five days after the course arrives to decide whether you want to keep it. If not, return it at our expense and your money will be immediately refunded.

Or Write For Free Circular "S"

THE PRESS GUILD, Inc., 66-S—West Broadway, N. Y.

THE PRESS GUILD, Inc.,
66-S—West Broadway, New York City

Enclosed find $10 for which you are to ship me at once, prepaid, Henry J. Brockmeyer's complete course in Practical Journalism with the distinct understanding that if I return the course in five days my full $10 will be refunded and no questions asked.

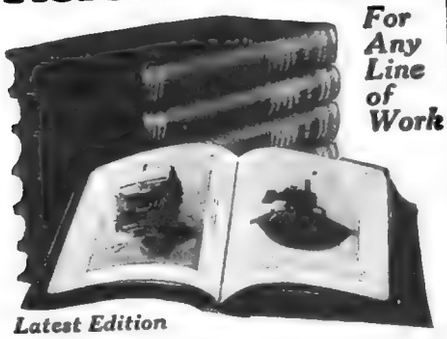
(Name) .....

(Address) .....

(City) ..... (S

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Price Cut ½ On World's Greatest Reference Books



For Any Line of Work

Latest Edition

Let experts work for you—In these books you will find the most remarkable collection of practical job experience and vital knowledge that was ever assembled in book form. More than 200 of the greatest engineers, lawyers, business men, and practical experts—all of them men who have gone through the mill—give you in these books a life-time of valuable inside information on the line of work in which you want to get ahead. Make their knowledge and experience your own. Let them show you all the newest methods—the best ways of doing things. This very minute you may be up against some tough problem—if you had these books you would solve it instantly. Send the coupon for

A Week's *Free* Trial

Just fill out the coupon and we will immediately send you any one of these libraries express collect. Read the books over carefully. Test them out thoroughly for seven days. If you do not want them, send them back at our expense. If you decide that they will do for you what they have done for 280,000 other men to whom they brought more money and success, pay $2.80 within one week and $3.00 a month thereafter until the special price is paid. This amounts to only 10c a day. Mail the coupon NOW if you want a bigger, better job and bigger pay.

Free Consulting Membership

A resident staff of from 15 to 20 practical experts is waiting to solve for you any difficulty that you may have. A letter or a wire to American Technical Society will bring you an immediate answer and the solution to your problems. This advisory staff of practical men plus your working and reference library will enable you to handle successfully any job in your line. These men know all the latest methods and the newest and best ways of doing things. Let this pay-raising consulting staff be YOUR SILENT PARTNER.

Your Choice 75c a Week

5 vols. Carpentry and Contracting—was $37.50 now.....19.80
12 vols. American Law and Practice (including free reading course and 250 page book of standard legal forms)—was $97.50 now.....49.80
8 vols. Applied Electricity—was $60.00 now 29.80
6 vols. Auto Engineering —was $45.00 now 21.80
9 vols. Civil Engineering —was $67.50 now 34.80
8 vols. Business Management—was $52.50 now 29.80
7 vols. Steam and Gas Engineering—was $52.50 now.....24.80
4 vols. Sanitation, Heating and Ventilating—was $30.00 now..14.80
4 vols. Fire Prevention and Insurance — was $30.00 now.....14.80
6 vols. Modern Machine Shop Practice — was $45.00 now.....21.80
4 vols. Telephone and Telegraphy—was $30.00 now.....14.80
4 vols. Drawing—was $30.00 now.....14.80

This free consulting membership offer is good for a limited time only and can be withdrawn without notice.

Send No Money

Here is your opportunity if you want to earn more money. Remember we are taking all the chance—you pay nothing until you are thoroughly convinced that these books will help you to greatly increase your pay. Isn't this about the fairest proposition that was ever made you?

American Technical Society
Dept. X-125 Chicago Ill

© A.T.S. 1923

AMERICAN TECHNICAL SOCIETY
Dept. X-125, Chicago

Please send me a set of.....
for seven days' FREE EXAMINATION, shipping charges collect. I will examine these books thoroughly, and if satisfied will send $2.80 within seven days and $3.00 a month until I have paid the special price of $..... If I decide not to keep the books, I will return them within one week at your expense. It is understood that if I keep the books I am entitled to a FREE Consulting Membership in the American Technical Society.

Name.....

Address.....

Reference.....
(Please fill out all lines, give local merchant, banker, or employer as reference.)

Changing Socket Slot

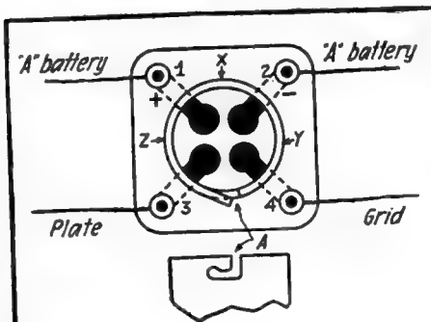
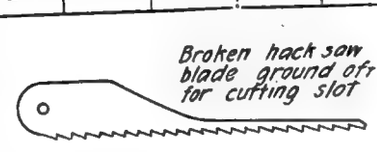


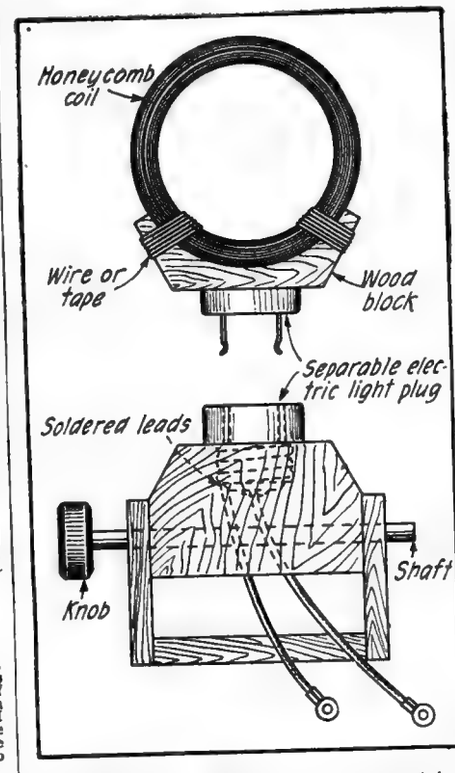
Chart for marking posts after change of slot

New slot cut at	+A 1	−A 2	Plate 3	Grid 4
X	G	P	−A	+A
Y	−A	G	+A	P
Z	P	+A	G	−A



Where moulded sockets are used it is often found that the slot into which the prong fits bends outward, and no longer holds the tube securely. When this happens, new slots may be cut at points X, Y or Z and the binding posts changed to the designations shown in the chart. A hack saw blade ground as shown will give excellent results for cutting the slots. —J. Arthur Calkins.

Mounting Honey Comb Coils



A separable electric lighting plate may be mounted as shown, one half on a honey comb coil and the other half in a wooden block. An efficient variable honey comb coil mounting will result. The base of the plug may be cemented into the hole in the wooden block if a tight fit cannot be made. The wooden support should be keyed solidly to the shaft. —C. W. Fancher.

World's Greatest BATTERY BARGAIN

FREE

Written 2-Year Guarantee
Your Proof of Performance

SPECIAL CHRISTMAS OFFER

Thousands of *Science & Invention* Readers will profit by this amazing offer. They will buy the famous 2-year guaranteed World Battery at the lowest price ever quoted. They will get their choice of a hydrometer and a "B" Battery or a nickeled Auto Spotlite FREE. And they get the best battery built, with 2-year ironclad guarantee.

Compare These Prices

Automobile Prices

6 Volt, 11 Plate - - $12.25
Ford, Chev., Mitchell, Hup., Grant, Elgin, Velie, Saxon.
6 Volt, 13 Plate - - $14.00
Overland, Buick, Reo, Paige, Hudson, Nash, Stude., Dort.
12 Volt, 7 Plate - - $17.00
Maxwell, Dodge, Regal, Frank., Briscoe and Crow-Elkhart.
Give year and model of car

Radio Prices

Special 2 Volt Storage Battery - - - - $5.00
For W. D. 11 and W. D. 12 Tubes. Will run 200 hours on one charge. Rechargeable.
Special 4 Volt Storage Battery - - - $8.00
For U. V. 199 Tubes. Same features as 2 Volt.
6 Volt, 60 Amps. - $8.50
6 Volt, 80 Amps. - 10.00
6 Volt, 100 Amps. - 12.50
6 Volt, 120 Amps. - 14.50
6 Volt, 140 Amps. - 16.00

SEND NO MONEY

You need not send a penny. Just clip this ad. and mail with your name and address. The battery you specify will be shipped to you that day your order is received. When the battery arrives, inspect it—read our 2-year guarantee before you pay one penny. Convince yourself you are protected from every angle—that the World Battery saves you 50 per cent. Get the "B" Battery and hydrometer, or Auto Spotlite FREE. Clip the ad. and send your order today.

WORLD BATTERY CO.
Dept. 19 1219 So. Wabash Ave., Chicago, Ill.

"B" Battery and Hydrometer

Your Choice Nickeled Auto Spotlight **FREE**

EDSON

Tone Tested Radio Headsets

$3 POST PAID

2000 or 3000 OHMS

THE lowest-priced first quality headset on the market today. Compare with headsets costing twice our price. Return ours if not satisfied. Our written guarantee protects you. **Send $3 by registered mail or money order.** Buy direct of us and save the difference. We ship, postage prepaid, same day order is received. Ask for our

Free Catalog of Radio Parts

EDSON RADIO SALES COMPANY
4 Elmwood Providence, R. I.

514-Page RADIO Handbook Only $1

Just off the press. The greatest book on Radio ever written. 514 pages. Compiled by Harry F. Dart, B.S.E.E., formerly with the Western Electric Co., and U. S. Army Instructor of Radio. Technically edited by F. H. Doane. Filled with sound, practical, tested information for every radio fan, from beginner to hard-boiled owl. Send $1 to-day, and get this 514-page I. C. S. Radio Handbook before you spend another cent on parts. Money back if not satisfied.

Mail the Coupon To-day

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6219-C, Scranton, Penna.

I enclose One Dollar. Please send me—postpaid—the 514-page I. C. S. Radio Handbook. It is understood that if I am not entirely satisfied I may return this book within five days and you will refund my money.

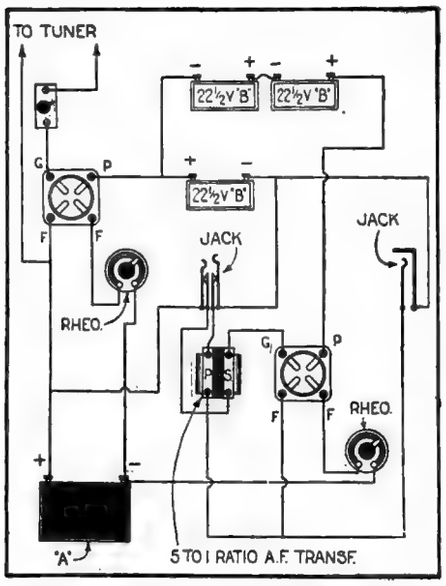
Name.....

Address.....

Digitized by Google

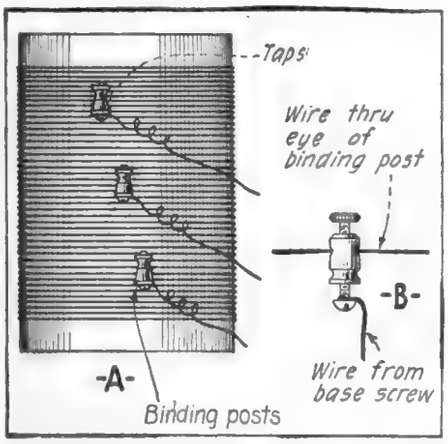
Original from UNIVERSITY OF CHICAGO

Filament Control Circuit



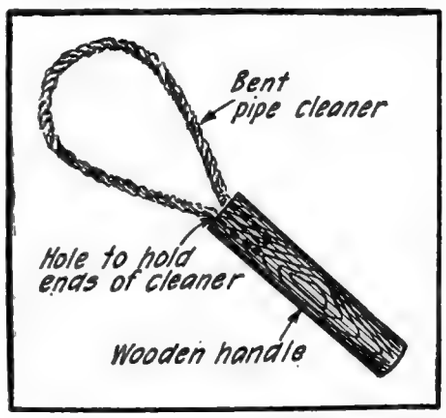
The standard filament control jacks are very difficult to connect, as many leads are necessary. If a double circuit jack and a single circuit jack are used and connected as illustrated, they will function as filament control jacks very efficiently. With the plug in the two circuit jack, the detector will light when the rheostat is turned on. With the plug out, or in the other jack, both filaments will light. —Jason Crain.

Solderless Connections



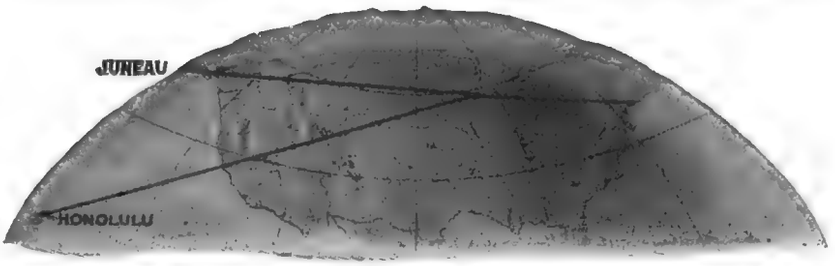
Small binding posts may be fastened to ordinary taps taken from inductance coils and connections made thereto, thereby eliminating the necessity of soldering. At B is shown how two wires may be connected together by means of a binding post. —H. N. Loeb.

Variable Condenser Cleaner



By bending a pipe cleaner and inserting the ends into a wooden handle as illustrated a cleaner will be made which can be run between the plates of variable condensers which will remove any dust or any foreign material which might cause trouble by short-circuiting the plates. This cleaner should be used frequently to keep the condensers at maximum efficiency. —Charles L. Higgins.

From New York to Honolulu
With Erla Synchronizing Transformers



Unequaled range and power, over a waveband of 200 to 700 meters, is assured by Erla synchronizing reflex transformers. List, $5 each

"All U.S. Stations on Loud Speaker, Using Only Three Tubes"

Typical of the thousands who have discarded complicated multi-stage receiving units in favor of simple, efficient Erla reflex design, is the experience of J. G. Hamock, 1917 So. Western Avenue, Chicago, who writes:

"During my first week with your three-tube hook-up, tuning through high power Chicago stations, I got Jefferson City, Dallas, Memphis, Atlanta, Omaha, Kansas City, St. Louis, New York, Springfield, Pittsburgh, Harrisburg, Louisville, Cincinnati, Fort Worth and Tampa.

"The Sunday following I added Fresno, Denver, Astoria, Ore., Los Angeles; Honolulu, Hawaii Naval Maneuvers; and Juneau, Alaska, the Alaska Electric Light and Power Company.

"*The United States Stations all were clear on the loud speaker. Also I re-tuned every station by checking them with my twelve-year old son, who would get them on the re-tune, whereupon I would, when required, sharpen the re-tune myself.*"

Unduplicated amplification without distortion enables Erla audio transformers to improve any receiving unit. Ratios: 3½ and 6 to 1. $5

Such power, selectivity and ease of control, with three tubes, are attainable only through Erla reflex design, incorporating Erla synchronizing radio and audio frequency transformers.

Guaranteeing the perfect synchronization of received and reflexed currents having the same phase characteristics, Erla transformers enable vacuum tubes to do triple duty, as simultaneous amplifiers of received radio frequency, reflexed radio frequency and reflexed audio frequency currents.

For complete details, ask your dealer for Erla Bulletin No. 14, giving Erla one, two and three-tube reflex hookups. Or write direct, giving your dealer's name.

Solve crystal troubles by installing an Erla fixed crystal rectifier. Once installed, no attention is required. Jolt and jar proof. List price, $1

Dealers and Jobbers: Erla scientific advancement is reflected in sensationally increasing Erla sales and correspondingly enlarged jobber-dealer profit. Write for our liberal discounts.

Electrical Research Laboratories
Dept. S 2515 Michigan Avenue, Chicago

ERLA

RUSONITE
CRYSTAL RECTIFIER
(Patent Pending)
THE PERFECT SYNTHETIC CRYSTAL DETECTOR
SENSITIVE OVER ENTIRE SURFACE
No Hunting for "Spots." Loud and Clear. Endorsed by Thousands of Satisfied Users.
Sensitiveness Guaranteed — Price Mounted 50c
14 K. Gold Supersensitive RUSONITE CATWHISKER, Permanent. Will not Oxidize. Price 25c
RUSONITE REFLEX CRYSTAL
Manufactured Expressly for Reflex Circuits
Will Stand Up Under Heavy Plate Voltage
Guaranteed — Price Mounted $1.00
WATCH FOR OUR NEW FIXED CONDENSER
Order from your dealer or direct from
RUSONITE PRODUCTS CORP., 15 Park Row, New York

The Real Metal Solder in Paste Form
SOLDERALL
Introducing Our New
SOLDERALL BLOW TORCH
of Heavy Solid Brass
Indispensable in the Home, Garage and to the Electrician. For Soldering Radio, House Wiring, Jewelry, Ignition, Kitchen Utensils, Etc.

SOLDERALL CO. Dept. S

Digitized by Google
Original from UNIVERSITY OF CHICAGO

MARKO "A" BATTERY

90 AMP. HRS.

IN RUBBERLITH CASE

Ornamental As Well As Efficient

The Rubberlith case is a composition case with a high gloss giving the appearance of ebony. It is moulded in one piece, including handles and cells—no jars to break—and is practically indestructible. A worthy addition to your set.

ALL SIZES, FROM 2 VOLT BATTERIES UP, CARRIED IN MAHOGANY FINISH CASES

DISTRIBUTED BY

MARKO STORAGE BATTERY CO., 210 West 54th St., New York, N. Y.
MARKO STORAGE BATTERY CO., 102 Jefferson Ave., Brooklyn, N. Y.
RADIO DISTRIBUTING CO., 8 W. Park St., Newark, N. J.
ALBANY RADIO CORPORATION, 356 Broadway, Albany, N. Y.
TRUE & BLANCHARD CO., Inc., Newport, Vt.
SCHIMMEL ELECTRIC SUPPLY CO., 526 Arch St., Philadelphia, Pa.

Sold by Radio Supply Stores and all Marko Service Stations

MADE BY

MARKO STORAGE BATTERY CO.

1402 ATLANTIC AVENUE, BROOKLYN, N. Y.

A New RICO Product

CAPACITY EQUALS 43 PLATE CONDENSER
REQUIRES ¼ THE SPACE

(Patents Pending)

THE "RICO" STRAIGHT LINE CONDENSER

This condenser marks a revolution in condenser building. It is the simplest and most practical type of condenser as yet developed for broadcast and amateur work. This condenser has been developed by our engineers after considerable research work and has been pronounced perfect by experts.

15 Outstanding Features

1—Large capacity (.001 Mf.). 2—Replaces a 43-plate condenser. 3—Uses a minimum of space, size 3⅛"x2⅛"x1¾". 4—For panel mounting or for table mounting—universal in its scope. 5—One complete revolution of dial adjusts condenser from minimum to maximum. 6—Vernier effect. 7—Absolute straight line curve. 8—Accumulates no dust between plates as is the case with air condensers entirely enclosed. 9—Light weight. Condenser only weighs 3 oz. 10—Less than 1-30th amount of parts as used in old style mesh plate condenser. 11—Can never get out of order. 12—Impossible to short circuit. Finest India Mica dielectric used. 13—Works in any position, vertical or horizontal. No counterweights needed. 14—Lowest in price for high class condenser. 15—Compactness. Size only 3⅛"x2⅛"x1¾" over all. The Rico Straight Line Condenser must be seen to be appreciated. Made of the best materials that money can buy. Stands in a class by itself. All metal parts finished in nickel plate. **Money refunded if this condenser is not all we claim for it.** No. 450 "Rico" Straight Line Condenser complete with molded dial, $1.75. No. 451, same condenser but without dial (shaft is for ¼ inch), $1.50.

SEND NO MONEY S.&I.-1

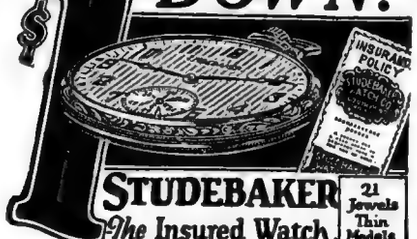
Radio Industries Corp., 131 Duane St., New York City

Gentlemen: Please send me by Parcel Post No.....
....."Rico" Condenser for which I will pay the postman the amount of .....

Name .....
Street .....
City ..... State .....

RADIO INDUSTRIES CORPORATION
131 DUANE STREET, NEW YORK CITY
Cable Address: Ricotrade, New York

$1 DOWN!



STUDEBAKER 21 Jewels Thin Models
The Insured Watch

The balance in easy monthly payments. The famous Studebaker 21 Jewel Watch—Insured for a lifetime; 8 adjustments, including heat, cold, isochronism and 5 positions—choice of 51 new Art Beauty Cases. Direct from the maker at lowest prices.

Fine Chain FREE!

BIG SPECIAL OFFER. Beautiful ... Free with every watch. ... while offer lasts.

WRITE

Send today for wonderful Studebaker Book of Advance Watch Styles and our $1.00 Down Offer—FREE!

..., Dept. 971, South Bend, Indiana

SEND FOR YOUR FREE COPY

TESTED HOOK-UPS

SUBMITTED BY USERS OF OUR

WONDERFUL TRANSMITTER

BUTTON FOR LOUD SPEAKERS

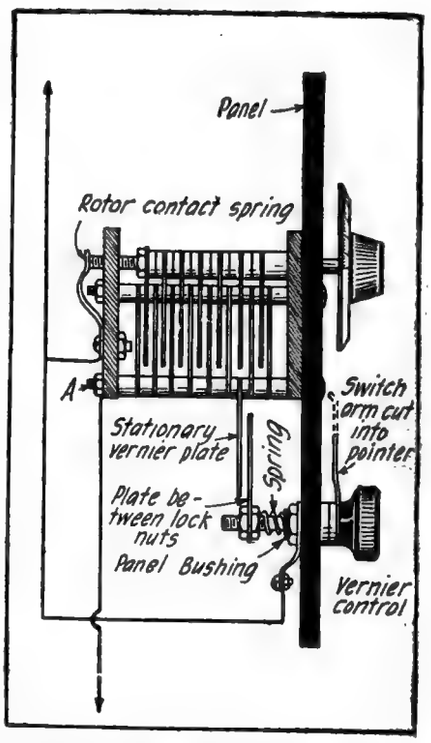
Price $1.00 POSTPAID with instructions

AMPLIFICATION AND EXPERIMENTS

K. ELECTRIC CO.

15 PARK ROW NEW YORK

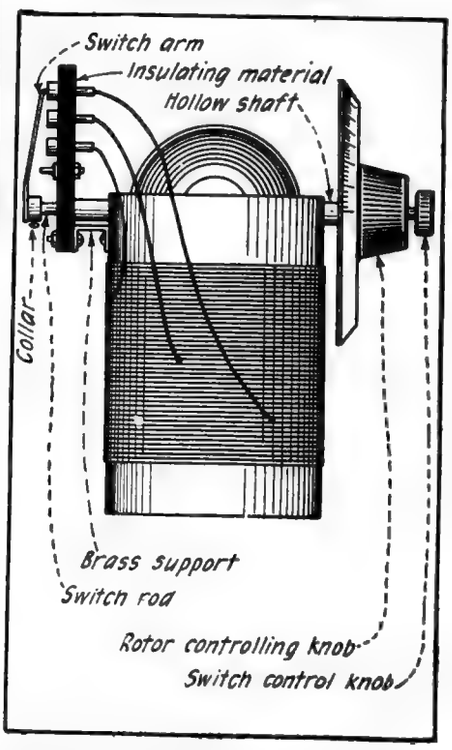
Vernier Condenser



A vernier variable condenser is one of the handiest instruments to place on a receiving set and an exceedingly simple, yet efficient type may be constructed as shown above. The variable condenser is partially dismounted and one of the stationary plate separators removed. Two thinner washers are then put in place of the separator, the total thickness of the two washers and the vernier stationary plate to equal that of the separator. A rotary plate is clamped between two nuts on a shaft and mounted as shown. The regular condenser dial is then used for coarse tuning and the small vernier control when fine tuning results are desired.

—Harry F. Gammeter.

Mounting Switches

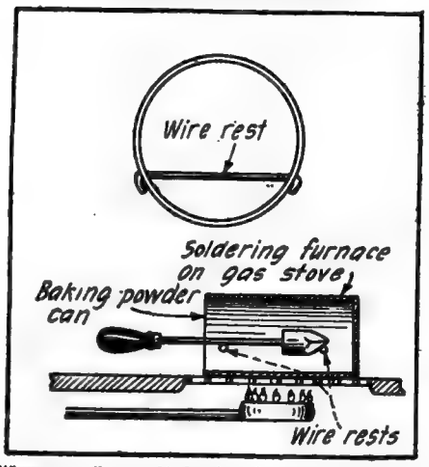


In order to eliminate the number of parts on a dial of a radio receiving set and at the same time centralize the controls, the switch points for controlling the inductance in the primary circuit may be mounted on a panel and fastened to the variocoupler as shown. The shaft on which the coupler secondary rotates must be hollow. Through its center passes a rod which controls the switch arm. This rod is rotated by means of the small knob.

—Stephen Goff, Jr.

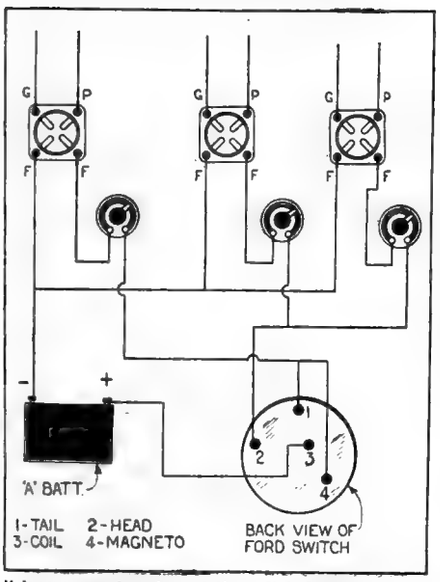
Digitized by Google Original from UNIVERSITY OF CHICAGO

Soldering Furnace



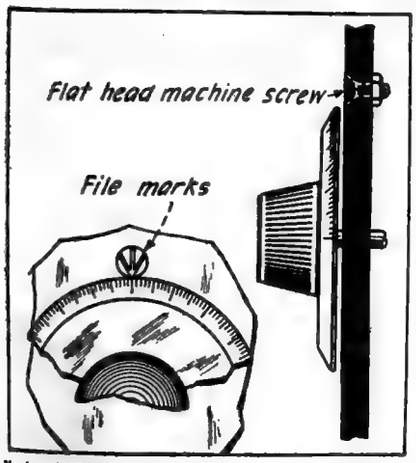
When an ordinary soldering iron is exposed to a gas or alcohol flame it usually becomes sooty and the tin is sometimes burned off. This is done away with by making a small soldering furnace as shown above. Place over a gas flame. —John L. Kenickell.

Lock Filament Circuit



It is very annoying when, at times, it is found that in the absence of the operator, the filaments of the tubes in a radio set have been turned on and left burning. It is possible to overcome this annoyance by connecting up a Ford switch as shown above. By turning off the switch when leaving, it can be locked in position and one who has no key cannot move it. —Kenneth Kesterson.

Dial Indicators



Neat and effective indicators of dial settings may be made from flat head machine screws by filing two slots in their heads and mounting as shown above. If the heads are painted black and the slots filled with engravers' white, a much better looking job will result. —Edward W. Lens.

(*Continued on page* 945)

The Improved MIRACO

Gets 'em From Coast to Coast

Model K
(SHOWN ABOVE)
$29.50

It is a two-tube outfit consisting of one stage of tuned impedance radio-frequency amplification with a tuner and vacuum tube detector.
This radio-frequency receiver amplifies before it detects, eliminates interference to a marked degree and has much more volume than most one-tube sets.

Model MW
(SHOWN BELOW)
$54.50

The Model MW consists of the same high-grade units as our Model K, with the addition of a two step audio-frequency amplifier in a single beautifully finished solid mahogany cabinet. It is a four-tube set, comprising one stage of tuned impedance radio-frequency amplification, detector and two stages of audio-frequency.

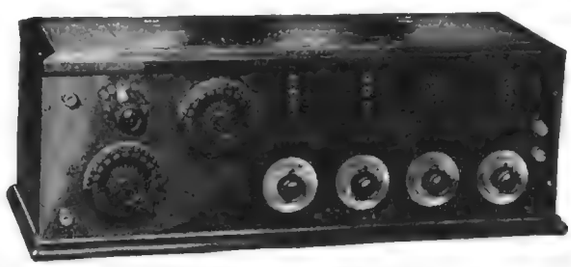
Just like the sweet, mellow tones of a flute or violin floating in from afar out on a lake—that's the way concerts come in through MIRACO receivers—and—

Not only from the nearby stations either. For our users tell us that Cincinnati hears 'Frisco, Denver hears Schenectady, New York hears Havana! Scores of long-distance records were made on these instruments last year so, with the many new refinements incorporated, the results obtainable will be far better now than ever.

HIGHEST QUALITY AT LOWEST PRICE

When the radio craze swept the country like a storm late in 1921, MIRACO was one of the first real successful sets to be placed on the market. *Highest quality* at the *lowest price* has always been our keynote, and the thousands of sets now in use all over the world are a fitting tribute to Miraco's excellent performance. Many new improvements have just been made in the MIRACO Models K and MW, such as new sockets resting on shock absorbing pads is a refinement found only in the most expensive and elaborate sets. Improved rheostats with multiple resistance windings makes it possible to use any type of tubes and a new aluminum shield prevents annoying body capacity effects.

The cabinet is of solid mahogany, workmanship throughout is the finest while its operation is extremely simple yet always dependable.



Write for our new bulletin TODAY

DEALERS — JOBBERS
Write for proposition quickly.

AGENTS
There's still some territory open —write or wire.

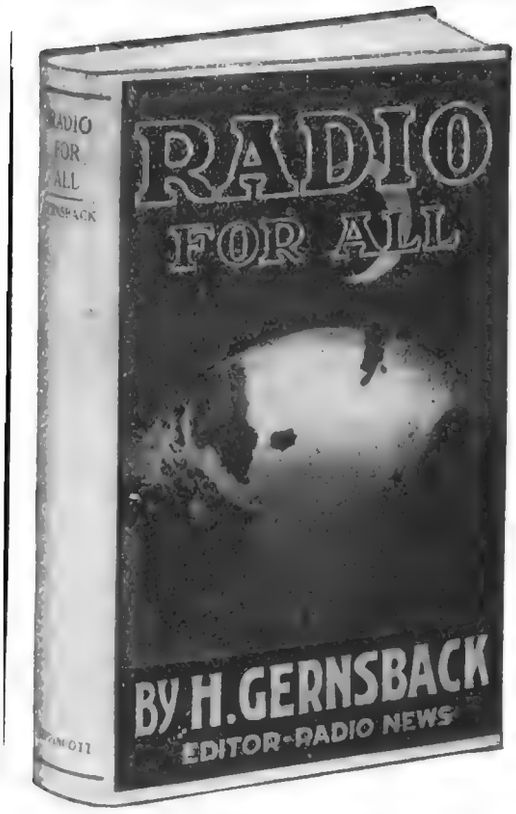
THE MIDWEST RADIO CO. 809 MAIN STREET CINCINNATI, OHIO

CATALOG E19-100 PAGES FREE
EVERYTHING IN RADIO
One of the largest complete stocks in the world. 40 diagrams of latest Hookups.
DEALERS ALL OVER THE U.S.
Making big profits handling our supplies. 24-hour service. Goods shipped same day order received.
American RADIO Mfg Co
WHOLESALE RADIO DISTRIBUTORS
Dept. F. 6 West 14th St. Kansas City, Mo.

BOYS! BOYS! BOYS!
THROW YOUR VOICE
Into a trunk, under the bed or anywhere. Lots of Fun fooling the Teacher, Policeman or Friends.
THE VENTRILO, a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it. NEVER FAILS. Also a 32 PAGE BOOK which gives full instructions on Ventriloquism. Formula for Secret Writing [Invisible Ink], 12 Money Making Secrets and 10 BIG TRICKS ON MAGIC all for 10¢
BOY. NOV. CO., Dept. 323 So. Norwalk, Conn.
LARGEST and OLDEST Mail Order House in Connecticut.

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C

Digitized by Google
Original from UNIVERSITY OF CHICAGO



RADIO FOR ALL

By H. GERNSBACK

Editor "Radio News," "Science and Invention" and "Practical Electrics"

With over 130 *illustrations and diagrams, and* 12 *photographs,* 300 *pages, size* 8¼" *x* 5½".

What the novice in radio needs is a book in which he can get all the information necessary for him to understand radio telephony and telegraphy, to make or buy a receiving set suitable to his means, to know how to operate his set, and after he has an understanding of the radio art, information that will enable him to advance and get the most out of his outfit. All this must ordinarily be dug out of text-books, pamphlets and government publications, but the aim of this book is to have all the data and information that the beginner will need from the time that he takes up radio. It is a permanent, comprehensive reference book for the dyed-in-the-wool dabbler in Radio.

What the Book Is.

A combination of a radio course for the novice in radio telegraphy and telephony with a reference book for the more experienced amateur. Half a dozen books in one.

For the Beginner.

The theory of radio carefully explained with drawings.
Description of and instruction for operating instruments of receiving and sending sets, with all picture diagrams of the wiring of the apparatus.
How to make your own receiving set, costing from $3.00 to $50.00.
How to read diagrams; for every picture diagram there is a corresponding technical diagram using the symbols instead of drawings.
How to tune sharply and eliminate interference from other stations.
How to protect your set from lightning and the laws regarding installation.
Explanation of time and weather signals.

For the More Experienced Amateur.

How to make a practical vacuum tube detector, two stage amplifier set costing less than $50.00, that will work.
How the radio compass works.
All about underground aerials, loop aerials and directional aerials.
Formulae for finding wave length; miscellaneous formulae for finding capacity of condenser and other instruments. Tables of wire resistances, wave lengths and their corresponding frequencies, approximate wave lengths for different aerials, tuning coil data, and much more invaluable information.

Special Features.

Lists of all the broadcasting stations in the United States and Canada for concerts, time signals, weather reports, press, stock market reports, etc., with their call, wave length and time of sending.
Detailed description of Washington weather signals and their translation.
Description of a modern broadcasting station and its operation.
Large map showing location of all U. S. radio telephone broadcasting stations suitable for hanging up in radio room.
Collection of miscellaneous radio information for the amateur.

In Other Words.

The information that you ordinarily have to dig out of government publications, text-books, pamphlets, etc., is handily combined in this one book.

The Complete Book of All Radio Information

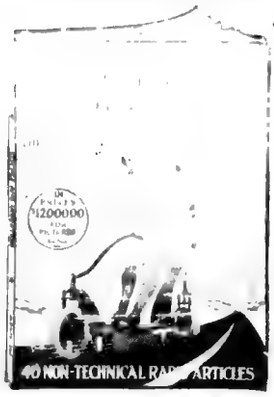
PRICE POSTPAID $2.00

PRACTICAL ELECTRICS COMPANY :: :: 53 PARK PLACE, NEW YORK CITY

The New

Science and Invention

In Pictures



THE STORY IS TOLD IN PICTURES under the new policy of SCIENCE & INVENTION. Comprehensive, timely and self-explanatory illustrations make the *NEW* SCIENCE & INVENTION more interesting than fiction.

SCIENCE & INVENTION combs the world for scientific news. It is represented by correspondents at every world capital, in every important laboratory — in fact at every place in the world where scientific development or achievement may occur.

EARLY AND ACCURATE REPORTS, careful handling by its editorial and art departments and the ability of its editor to give his readers just what they want has made SCIENCE & INVENTION a by-word and has won for it a place in every home.

AN ELABORATE NETWORK OF CORRESPONDENTS is maintained by SCIENCE & INVENTION. You can be part of this great system and enter our $12,000 PRIZE CONTEST. Write and ask for details. Get a Reporter's Card.

MORE THAN 100 PAGES — SPECIAL PRIZE CONTESTS — 300 ILLUSTRATIONS EACH MONTH.

Radio News

"The Largest Radio Magazine in the World"

RADIO NEWS is read by one million radio enthusiasts every month—a certain proof of its superiority, quality and popularity.

GREATER IN CIRCULATION, number of pages, articles and illustrations, it is the indisputable peer of radio magazines.

WHETHER YOU ARE a radio amateur, experimenter, dealer, manufacturer or layman, you will find much in RADIO NEWS of interest and value.

RADIO NEWS keeps you in touch with all new radio developments, new hookups, achievements, apparatus and with the field in general.

IF YOU HAVE ANY INTEREST WHATEVER in radio you should read RADIO NEWS every month. It will pay you to do it.

RADIO NEWS CONTAINS more articles by radio experts—more specific information — detailed drawings — illustrations and news—than is published in any other radio magazine.

EXPERIMENTER PUBLISHING CO.,
53 PARK PLACE, NEW YORK

Enclosed find .....dollars for which please enter my subscription to

..... for ..... years.

Name .....*Address* .....

SUBSCRIPTION RATES

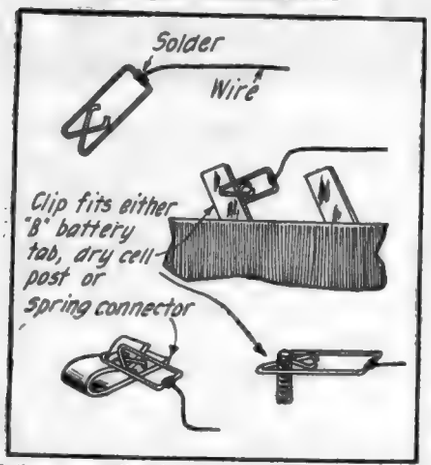
Radio News—One Year...$2.50
Radio News—Two Years.. 4.25
Science & Invention—One Year 2.50
Science & Invention—Two Years 4.25
(Canadian and Foreign 50 cents per year additional)
Or at all Newsstands at 25 cents Per Copy

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Radio Wrinkles

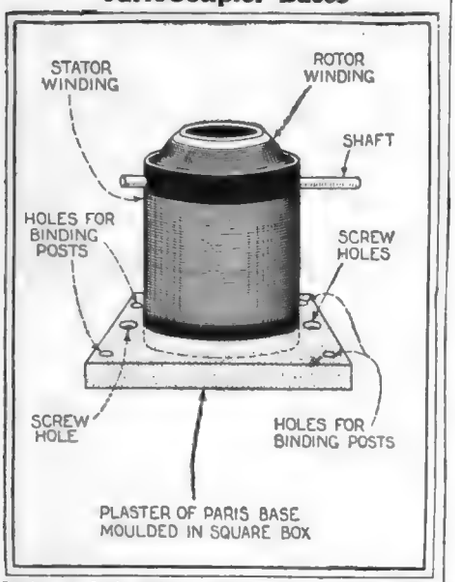
(*Continued from page 943*)

Simple Connectors



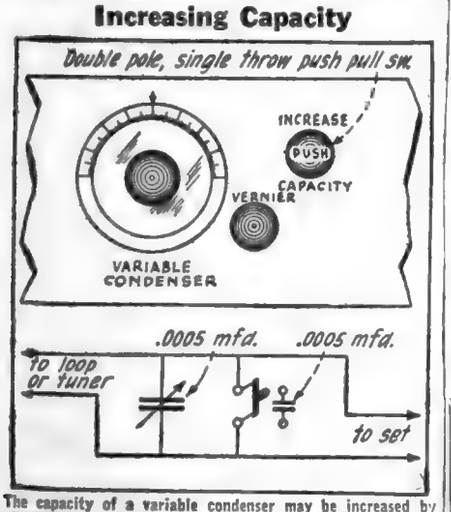
Ordinary paper clips of the type illustrated above make very good connectors for use on different radio apparatus. The illustration shows how they can be used for clipping on to "B" batteries, machine screws, or spring connectors.
—L. B. Robbins.

VarioCoupler Bases

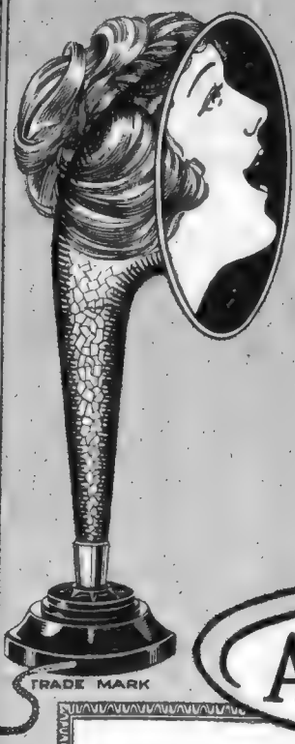


Plaster of Paris makes a very good base for mounting variocouplers and it may be made as shown above. The holes for the binding posts and mounting screws should be moulded directly into the base. The stator of the coupler should be put into place before the plaster of Paris sets.

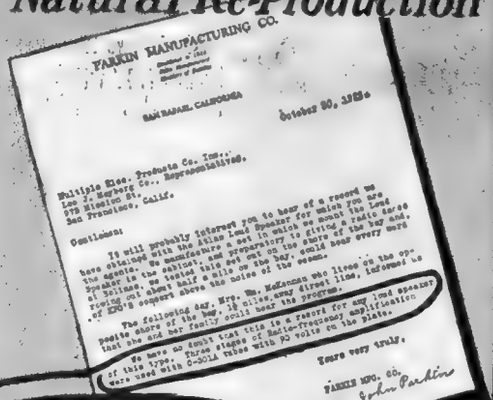
Increasing Capacity



The capacity of a variable condenser may be increased by placing in parallel with it a small fixed condenser of the same capacity. This is connected with double-pole single-throw switch which should preferably be of the push-pull type. By closing the switch, the total capacity will be variable from .0005 to .001 mf.



Atlas
LOUD SPEAKER
Natural Re-Production


FARRIN MANUFACTURING CO.
SAN RAFAEL, CALIFORNIA
October 20, 1923.
Multiple Elec. Products Co. Inc.,
Leo J. Meyberg Co., Representatives,
San Francisco, Calif.
Gentlemen:
It will probably interest you to hear of a record we have obtained with the Atlas Loud Speaker for which you are the agents. We manufacture a set in which we mount the Loud Speaker in the cabinet and we put one on the bay, at Tolinas, about half a mile on the bay shore of this town, giving us almost above the noise of the ocean.
The following day, Mrs. Mc.Kennan who lives on the opposite shore of the bay, 18 miles, near direct line, informed us that she and her family could hear the program.
So here we have three stages of Radio-frequency amplification of this type. Three stages of Radio-frequency amplification were used with Loud Speaker with no volume on the plate.
Yours very truly,
FARRIN MFG. CO.
Per John Farrin

TRADE MARK

A Record!

ENTHUSIASTIC TESTIMONY straight from an impartial authority. RE-PRODUCTION is a *fact*. The delicate overtones which give music its roundness, resonance and timbre, are faithfully re-born through the modern magic of the patented "double diaphragm." This extremely responsive device is adjustable to the exact requirements of your set and individual receiving conditions. *Write for Illustrated Booklet "T"*

Atlas Loud Speaker Unit
With Phonograph Attachment $13.50
Without Phonograph Attachment . . . $12.50

Letters From Users Requested
What have you accomplished with your Atlas Amplitone? Tell use about it.

Sole Canadian Distributors
The Marconi Wireless Telegraph Company of Canada, Limited

Ask Your Dealer for a Demonstration
List Price Complete
$25

Multiple Electric Products Co. Inc.
ORANGE ST., RADIO DIVISION NEWARK, N.J.

"THERE'S MONEY IN IT"
AT HOME LEARN TELEGRAPHY AT HOME
MORSE AND WIRELESS

TEACH YOURSELF in half usual time, at trifling cost, with the wonderful Automatic Transmitter THE OMNIGRAPH. Sends unlimited Morse or Continental messages, at any speed, just as an expert operator would. Adopted by U. S. Government, and leading Universities, Colleges and Telegraph Schools. 3 styles. $14 to $30. Catalog free.

If you own a Radio Phone Set and don't know the Code, you are missing most of the fun.

OMNIGRAPH MFG. CO. 22 Hudson St., NEW YORK

HB 8 HOUR Battery Charging Pays Big Monthly Profits

Small cash payment puts HB Constant Potential Outfit in your shop. Your increased profits easily carry the small $20 monthly terms, with good surplus besides. HB 8-Hour service builds trade, beats competition. An HB saves you $35 to $115 over any other outfit on purchase price alone. Sold on 30 days' free trial with money-back guarantee. HB Constant Potential saves current, labor and rental batteries. HB Patented Voltage Regulating Winding absolutely eliminates reversing. Write today for Bulletin 321.
HOBART BROS CO., Box S14, TROY, OHIO

Profits Easily Carry Small Monthly Payments

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Opportunity Ad-lets

YOU will find many remarkable opportunities and real bargains in these columns. It will pay you to read and investigate the offerings made every month by reliable firms, dealers and amateurs from all over the country. No matter what you may be seeking, whether supplies, automobile accessories, the opportunity to make money, or anything else, you will find listed here the best and most attractive specials of the month.

Advertisements in this section twelve cents a word for each insertion. Name and address must be included at the above rate. Cash should accompany all classified advertisements unless placed by an accredited advertising agency. No advertisement for less than 10 words accepted.

Ten per cent. discount for 6 issues, 20 per cent. discount for 12 issues. Objectionable or misleading advertisements not accepted. Advertisements for the March issue must reach us not later than January 15.

The Circulation of Science and Invention is over 160,000 and climbing every month

EXPERIMENTER PUBLISHING CO., INC., 53 Park Place, New York City, N. Y.

Agents Wanted

Agents—Best seller; Jem Rubber Repair for tires and tubes; supersedes vulcanization at a saving of over 800 per cent; put it on cold. It vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Dept. 601, Philadelphia, Pa.

Big money and fast sales. Every owner buys gold initials for his auto. You charge $1.50; make $1.35. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 71, East Orange, N. J.

Make $25 to $50 week representing Clows' Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clows Company, Desk 37, Philadelphia, Pa.

Wonderful Invention—Eliminates all needles for phonographs. Saves time and annoyance. Preserves records. Lasts for years. 12,000,000 prospects. $15.00 daily. Free sample to workers. Everplay, Desk 17, McClurg Bldg., Chicago.

We want Salesmen and Agents, either whole or side line, to sell our low priced radio books to the trade. Excellent proposition for live wires. The E. I. Company, Publishers, 233 Fulton Street, New York City.

Write and learn how to start profitable business without capital or experience. Silvering mirrors, refinishing auto headlights, tableware, plating. Outfit furnished. International Laboratories, Dept. 25, 309 Fifth Ave., New York.

Earn big money fast applying gold initials to autos. Every owner buys—$1.35 profit on $1.50 sale—particulars and samples free. Write quick. Lithogram Co., Dept. 19, East Orange, N. J.

Only one sale a day means $200 per month! Five sales, $1,000 per month! Marvelous new adding machine. Retails $15. Work equals $350 machine. Adds, subtracts, multiplies, divides automatically. Speedy, accurate, durable, handsome. Five-year guarantee. Offices, stores, factories, garages, buy one to dozen. A fortune for live agents. Write quick for protected territory and free trial offer. Lightning Calculator Co., Dept. W., Grand Rapids, Mich.

$60—$200 a week. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 441 B, North Clark, Chicago.

Agents—$15 a day—Easy, quick Sales—Free Auto—Big weekly bonus — $1.50 premium Free to every customer. Simply show our Beautiful, 7-piece, Solid Aluminum Handle Cutlery Set. Appeals instantly. We deliver and collect. Pay daily. New Era Mfg Co., 803 Madison St., Dept. 88G, Chicago.

Agents—Big returns, fast office seller; particulars and samples free. One Dip Pen Co., 13 Daily Record Bldg., Baltimore, Md.

Rummage Sales make $50.00 daily. We start you. Representatives wanted everywhere. Wholesale Distributors, Dept. 32, 509 Division Street, Chicago.

Earn $10 daily silvering mirrors, plating and refinishing metalware, chandeliers, bedsteads, headlights. Outfits furnished. N. Decie Laboratories, 1133 Broadway, New York.

Agents—Our soap and toilet article plan is a wonder; get our free sample case offer. Ho-Ro-Co., 2719 Dodier, St. Louis.

We start you without a dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept. 232, St. Louis.

A business of your own: Make sparkling glass name plates, numbers, checkerboards, medallions, signs, big illustrated book Free. E. Palmer, 313, Wooster, Ohio.

Agents Wanted to Advertise our goods and distribute free samples to consumers; 90c an hour; write for full particulars. American Products Co., 1538 American Bldg., Cincinnati, O.

New Wonderful Seller. Over 100 per cent profit on every sale of Harper's Ten-Use Set. Needed in every home. Washes and dries windows, sweeps, scrubs, mops, etc. Greatest year 'round seller. Write Harper Brush Works, 152—2nd St., Fairfield, Iowa.

Rug Salesmen—Get next to the biggest seller of the year—Loomrite Felt Rugs. Sell at sight at $2.50, cost $15 dozen. Big, complete Rug Catalog, Free. Maisley-Payne Mfg. Co., 104-S Hanover St., Boston, Mass.

Agents sell Wolverine Laundry Soap. Wonderful repeater and good profit maker. Free Auto to hustlers. Wolverine Soap Co., Dept. B16, Grand Rapids, Mich.

Start your own business as our sole agent, selling 100 famous home products. All or spare time. Dr. Blair Laboratories, Dept. [illegible] Lynchburg, Va.

300 Per[illegible] mendous P[illegible] 1943-K [illegible]

Whirlwind Seller. Tre- Bestever Products Co.,

Agents Wanted (Continued)

Formulas, Processes, Trade-Secrets—Different, dependable, profitable. Catalog free. D. Thaxly Co., Washington, D. C.

An agent wanted in every town to sell double-suction cups. For sample and full details send ten cents. Hawaiian Rolling Bar Co., Sayville, N. Y.

Every person playing Hawaiian guitar should use a Rollers-Royce Rolling Bar. They don't slide, they roll. Agents wanted. Hawaiian Rolling Bar Co., Sayville, N. Y.

$10 daily silvering mirrors, plating and refinishing lamps, reflectors, autos, beds, chandeliers by new method. Outfits furnished. Write Gunmetal Co., Ave. D, Decatur, Ill.

Agents Wanted Full or Part Time To Sell on liberal commission new Thermostatic Automatic Carburetor control Attachment for Ford cars. Increases mileage 100 per cent. No holes to drill. Attached in 2 minutes. Does automatically exactly what Ford Manual instructs driver do by hand. Cadillac now using Thermostatic Carburetor Control under Blancke license. Write at once. A. C. Blancke & Co., Dept. 21 602 W. Lake St., Chicago.

Start clean business manufacturing our Acme Doughnut Flour. Makes pure, wholesome, delicious doughnuts. Ready Sales. Full directions Two Dollars. American Cereal Company, Everett, Washington.

American Made Toys

Manufacturers on large scale, also homeworkers, wanted to manufacture Metal Toys and Novelties, Barking Dogs, Wag-Tail Pups, Wild Animals, Automobiles, Indians, Cow-Boys, Baseball Players, Cannons, Toy Soldiers, Crowing Roosters, Statues of Liberty, Miniature castings of Capitol, Bathing Girl Souvenirs and others. Unlimited possibilities. Guaranteed Casting forms furnished manufacturers from $5.00 up, with complete outfit. No experience or machinery necessary. Hundreds made complete per hour. We buy goods all year and pay high prices for finished goods. Cash on Delivery. Contract orders placed with manufacturers. Enormous business waiting to be taken care of in 1924. Catalog and information free. Correspondence invited only if you mean business. Metal Cast Products Co., 1696 Boston Rd., New York. Established since 1912.

Automobiles

Automobile owners, garagemen, mechanics, send for free copy America's popular motor magazine. Contains helpful, money-saving articles on repairing, overhauling, ignition, carburetors, batteries, etc. Automobile Digest, 541 Butler Bldg., Cincinnati.

Battle Photos and War Relics

For Dens: Relics Collected from Europe's Battlefields. **Firearms,** medals, helmets, etc. Illustrated catalogue and sample War Photographs 25c. Lieut. Welch, 2117 Regent Place, Brooklyn, N. Y.

Books

Free—Upon request will send you my literature illustrating the following books. Astrology, Character, Clairvoyance, Concentration, Healing, Hypnotism, Magnetism, Mediumship, Personal Magnetism, Personality, Physiognomy, Salesmanship, Seership, Success, Sex, Will, Yogi Philosophy, Gazing Crystals, etc. A. W. Martens, E.E. 6, Burlington, Iowa.

"Lights, Colors, Tones and Nature's Finer Forces," including Vibrations; Odic-Auras; Electro-Magnetons, Cold-lights; Radio; Coming Inventions, 270 pages. Satisfaction Guaranteed; $2.00, Circulars Free. Stevens Research Laboratories, 242 Powell Street, San Francisco, Calif.

Perpetual Motion, by Perry Verance. A history of the efforts to discover same from earliest days to the present, together with a scientific discussion regarding the possibility of its ultimate achievement. Profusely illustrated, 257 pages. Price postpaid, $2.00. The Enlightenment Specialty Co., 305 Fourth St., Edwardsville, Ill.

Diseases and Their Innate Healer. Book 50 cents. Arthur Stevens, Wauseon, O.

"Master Key" $2.50. "Power of Will" $3.00. Coue's 50c. Phipps, 1014 Belmont, Chicago.

Hypnotism Astounds, controls. Wants gratified. 25 easy Lessons $2.75. "Mindreading" (Any distance) Wonderful. Genuine. Guaranteed $2.75. "Book of Wonders, Mysteries and Disclosures" $20.00 worth for $2.00. All three $5.00. Catalogs free. Science Institute, SV1014-Belmont, Chicago.

Sleep Quickly Produced. Self or others. Infallible. Priceless. Guaranteed $1.10. "How to Live Right" 10c. "Way to Win" 10c. Prof. Deprado, SV357 Oak, Chicago.

Business Opportunities

Sell us your spare time. You can earn Fifteen to Fifty dollars weekly writing show cards at home. No canvassing; pleasant profitable profession, easily, quickly learned by our simple, graphic block system, artistic ability unnecessary; we instruct you and supply work. Wilson Methods, Limited, Dept. 51-M, Toronto, Canada.

You can have a business-profession of your own and earn big income in service fees. A new system of foot correction: readily learned by anyone at home in a few weeks. Easy terms for training, openings everywhere with all the trade you can attend to. No capital required or goods to buy, no agency or soliciting. Address Stephenson Laboratory, 18 Back Bay, Boston, Mass.

Stop Plodding! Be Successful. Operate a Tire Repair Shop. Make big profits in any locality. We teach you and furnish complete equipments $100 up. Book of Opportunity free. Haywood's 1312 South Oakley Avenue, Chicago.

Wanted—County Distributors for World Fastest Selling Automobile Accessory. Write A. Benross Co., 384 East 144th Street, New York.

$50 to $150 Weekly Writing Jokes, Epigrams and Humorous Stories for publications. Write for details. American Institute of Humor, Office E, 414 Park Bldg., Cleveland, Ohio.

Dollars yearly in your backyard. No mushroom dope. Particulars free. Metz, 313 East 89th, New York.

For $5 we'll write three catchy, classified advertisements that will simply have to bring you business. We'll name rates of most profitable magazines, how to use them, etc. Martinek Company, 54 Humphrey Street, Corona, N. Y.

Free Book. Operate little Mail Order Business home evenings, Pier, 515 Cortland St., N. Y.

Chemistry

Learn Chemistry at Home. Dr. T. O'Conor Sloane, noted educator and scientific authority, will teach you. Our home study correspondence course fits you to take a position as chemist. See our ad on page 917 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

Any Product, formula, duplicated, improved, cheapened. Harding, P.O. 1029, Chicago.

Experimenters. We carry a complete supply of chemicals and glassware for your laboratory. Catalogue 5c. National Scientific Supply Co., 241 Pa. Ave., Washington, D. C.

Experimental Chemicals and Apparatus. Price list 5c. George Ott, 1218 Chestnut St., Reading, Penna.

Chemical Laboratory Supplies. Catalog 5 cents. Union Laboratory Supplies, 518 Syms St., West Hoboken, New Jersey.

Chemicals—Amateurs and Experimenters, we can supply chemicals and apparatus that you need. Prices reasonable. Write for list. Midwest Chemical Co., 2752 Armond Place, (rear) St. Louis, Mo.

Correspondence Courses

Correspondence courses sold complete, 1/3 usual prices because slightly used; easy terms; money back guarantee. All schools and subjects. Write for Special Free Catalog. Courses bought for cash. Economy Educator Service, H262 West 49th St. New York.

Used correspondence courses bought and sold. Bargain catalogue 1000 courses free. Students' Exchange, Dept. 4, 47 West 42d St., New York.

Used Correspondence courses of all schools sold, rented and exchanged. New 1924 catalogue free. (Courses bought). Lee Mountain, Pisgah, Alabama.

Duplicating Devices

"Modern" Duplicators save Time, Labor and Money. Gets Business. Reproduces Typewritten or penned letters, Drawings, Lessons, Music, Menus, Bids, Notices, Specifications, Maps or anything in one or more colors. Prints two per minute. Special Sale On. 30 Days' Free Trial. $3.25 up. Booklet Free. B. J. Durkin-Reeves Co., Pittsburgh, Pa.

Ford Owners

Sport Cars. Fast, saucy, hug the turns and stick to the road—make you glad you're a Ford owner. Can easily be built by aid of life size "Red-i-Kut" patterns and picture instructions. The "Pal" system delivered complete with pressed metal streamline tail for $6.49. Garage men make big money building them. Send for prospectus on making sport cars—Jiffy Tops and Gosum windshields. Kuempel Co., 1100 Kuempel Bldg., Guttenberg, Iowa.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Exchange

Gundlach Telescope, three inch objective lens, seventy dollars, real bargain. Edward Prentice, Binghamton, N. Y.

For Sale. Complete outfit for the manufacture of Radio Variable Condensers, including dies, jigs, parts, finished and unfinished condensers. Exceptionally cheap. Write for detailed information. Zeunert Mfg. Co., 1752 North Park Ave., Chicago, Ill.

For Inventors

Patent Application, including one sheet drawings, prepared for $15. Further particulars. Arthur M. Benner, Olympia, Washington.

Get your own patents. Application blanks, complete instructions $1. Cutting Bros., Campbell, Calif.

Your Chemical problem solved and working process furnished for Five Dollars. Write me. W. Stedman Richards, Consulting Chemist, Box 2402, Boston, Mass.

Specialized service for inventors. You furnish the idea, we'll work it out. Expert machine designing. Drafting. Opinions given on practicability of ideas. Confidential dealings. Your ideas fully protected. Write for full particulars. Otis Engineering Co., Desk EF, Omaha, Nebraska.

Formulas

Moneymaking Books, Plans, Formulas. Catalog Free. Ideal Book Shop, 5501-E, North Robey, Chicago.

For the Photographer

Have you a Camera? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 118 Camera House, Boston, 17, Mass.

Games and Entertainment

Tricks, Puzzles, Jokes, Magical Apparatus, Plays. Stage Supplies, Mind-Reading, Acts and Sensational Escapes. Send 10c for 160-page illustrated 1923 professional catalogue. Oaks Magical Co., Dept. 549, Oshkosh, Wis.

Health

Study Sexology—Publication dealing forcefully with the vital problems of intimate marital sex life will be sent on receipt of 20c—Health and Life Publications, Dept. 108, 833 S. Dearborn Street, Chicago, Illinois.

Free to Men—Information of a scientific nature that has brought physical vigor and happiness to thousands. No charge; no obligation. Enclose stamp for reply. C. I. Wood & Co., Colorado Springs, Colorado.

Help Wanted

We want Salesmen and Agents, either whole or side line to sell our low priced radio books to the trade. Excellent proposition for live wires. The R. I. Company, Publishers, 233 Fulton Street, New York City.

Detectives Earn Big Money. Travel. Excellent opportunity. Great demand everywhere. Experience unnecessary. Particulars free. Write, American Detective System, 1976 Broadway, N. Y.

Get posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 932.

Railway Postal Clerks—Start $133 month. Railroad pass; expenses paid; questions free. Columbus Institute, H-4, Columbus, Ohio.

Be a Detective; Excellent opportunity; good pay; travel. Write C. T. Ludwig, 1417 Westover Bldg., Kansas City, Mo.

Make Money in spare time mailing letters. Rare opportunity now. Men, send addressed envelope for special plan. Normande R. 147 W. 23d St., New York.

All men, women, boys, girls, 17 to 65, willing to accept Government positions, $117-$250, traveling or stationary, write Mr. Ozment, 233, St. Louis, Mo., immediately.

Silvering Mirrors, French plate. Easily learned, immense profits. Plans free. Wear Mirror Works, Excelsior Springs, Mo.

Earn $25 Weekly, spare time, writing for newspapers, magazines. Experience unnecessary; details free. Press Syndicate, 5665 St. Louis, Mo.

Firemen, Brakemen, Baggagemen, Sleeping car, train porters (colored). $140-$200. Experience unnecessary. 897 Railway Bureau, E. St. Louis, Ill.

U. S. Government wants help. Men-Women 18 up. $92-$250 month. Steady. Vacation, influence unnecessary. List positions free. Write immediately. Franklin Institute, Dept. E24, Rochester, N. Y.

South America Needs skilled help. Write Employers Direct. 388 Addresses $1. South America Information Bureau, Portland, Oregon.

Wanted—Railway Mail Clerks. $1600. Experience or correspondence course unnecessary. Write, Mr. Selby, D78, Willow Hill, Ill.

Improved Made Toys

Wanted Manufacturers and Housewokers to manufacture Metal Toys and Novelties. Wonderful opportunity. Millions needed. In Whistling Birds, Wild Animals, Wag Tail Pups, Crowing Roosters, Automobiles, Baseball Players, Statue of Liberty, Indians, Toy Soldiers, Barking Dogs; and 50 others. No experience or tools necessary. Guaranteed casting forms with complete outfit, at cost. From $3.50 up. We buy goods all year. Cash on delivery. Higher price for finished goods. Contract orders placed. Send for catalog and information free. The Improved Metal Casting Co., 343 East 145 St., New York.

Instruction

Instruct Yourself for desired Successes. Illustrative chart shows Success(ive) Steps. Postpaid 50 cents. J. E. Morvey, Box 304, Madison Sq. Sta., N. Y.

Learn Chemistry at Home. Dr. T. O'Conor Sloane, noted educator and scientific authority, will teach you. Our home study correspondence course fits you to take a position as chemist. See our ad on page 917 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

Insects Wanted

Get posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 932.

Languages

World-Remic System, Masterkey to All Languages. Primers, 23 languages, $1.94 each language: English, French, German, Italian, Portuguese, Spanish. Pronunciation—Tables. 102 languages, 30c each language. Language Publishing Company, 8 West 40th Street, New York.

Manufacturing

To order: Metal articles, simple, or complicated machinery. Models, tools, patterns. Experimenting, Parma Engineering Works, Brooklyn Station, Cleveland, O.

Machinery and Tools

Concrete Building Block Machines and Molds. Catalogue free. Concrete Machine Co., 305 South Third St., St. Louis, Mo.

Miscellaneous

Free Complete Price List. Aitken Radio Co., 504 Superior St., Toledo, O.

Kodak + Hospital. Camera-Exchange. Used Cameras sold, exchanged, bought (any condition). Expert Camera Repairing a specialty. Send your broken Camera. Turner. 1679 Ave. A, N. Y.

Stuck? What is it? A problem, question or experiment in radio, physics, chemistry, biology, electricity, mathematics, etc. Prompt and accurate information furnished amateurs. Enclose one dollar to cover expenses. Address Society Amateur Scientists Bureau, Technical Information, 225 Lynch St., Brooklyn, N. Y.

We Develop your ideas into commercial shape for presentation to purchasers, making working models, drawings, experiments or tests. Courtesy, efficiency, secrecy and ample equipment; 30 years' experience. Ducorron-Rich Engineering Co., 504 Pacific Manual Bldg., Los Angeles, Cal.

Get posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 932.

Price List of packets, sets, single stamps free upon request. Premium to approval applicants. Yonkers Exchange, Yonkers, N. Y.

Questions Answered on any subject. One dollar each. Money returned if answer cannot be given. Fee for elaborate investigations and reports arranged by correspondence. Technical Associates, P. O. Box 1478, Boston, Mass.

Motion Picture Business

$35 Profit Nightly. Small capital starts you. No experience needed. Our machines are used and endorsed by Government institutions. Catalog free. Atlas Moving Picture Co., 470 Morton Bldg., Chicago, Ill.

Motorcycles—Bicycles

Build it Yourself—A Real Automobile that any handy man or boy can build. A low-slung, speedy cycle car. Power supplied by famous 2½ H.P. Shaw Motor. Send stamp today for Descriptive Circulars or send 25c for Complete Book of Easy-To-Follow Plans. Shaw Mfg. Co., Dept. S.I.-1, Galesburg, Kansas.

Novelties

Magic goods, cards, books, novelties. Catalogue free. Clifford Fenner, 2401 Jefferson, Louisville, Ky.

Patents

Inventions Commercialized. Patented or unpatented. Write Adam Fisher Mfg. Co., 205, St. Louis, Mo.

Unpatented ideas can be sold. I tell you how and help you make the sale. Particulars free. Write W. B. Greene, Jenifer Building, Washington, D. C.

Patents For Sale

For Sale—Patents: Nut and Bolt Locks, designed to resist vibration; Metal toy Aeroplane, useful and decorative. Weather-vane for barns, garages, etc. M. B. Rumfelt, South Lima, N. Y.

Brush's Pad, No. 1,224,581 for $16,000.00. C. B. Tyford, 617 Bailey St., Zanesville, Ohio.

Patent Attorneys

Patents. Send for free booklet. Highest references, Best results. Promptness assured. Send model or drawing for examination and opinion. Watson E. Coleman, Patent Attorney, 644 G Street N. W., Washington, D. C.

Inventors write me about patents. My fees payable monthly. Booklet free. Frank Fuller, Washington, D. C.

Herbert Jenner, Patent Attorney and Mechanical Expert, 624 F Street, Washington, D. C. I report if patent obtainable and exact cost. Send for circular.

Lacey Patent-Sense. "The book the inventor keeps." Free. See page 924.

M. P. Laughlin, Patents. Engineer-Attorney, 48 East 41 Street, New York.

H. F. Lowenstein, Registered Patent Attorney, Radio Expert, 825 McLachlen Building, Washington, D. C.

"Inventors' Guide" free on request; gives valuable information and advice for all who have original ideas or improvements. Frank Ledermann, Registered Attorney and Engineer, 15-E Park Row, New York.

"Inventor's Adviser," the valuable Patentbook with 139 mechanical movements and illustrations, sent free upon request. M. I. Labiner, Patent Attorney, 3 Park Row, New York.

Patents, Trademarks, Copyrights procured; all countries; very reasonable; 20 years' experience; booklet Free. H. Sanders, Registered Patent Attorney, 13 Rand McNally Building, Chicago.

Commercialize your ideas according to My Cooperative Plan. Booklet free. Ralph Burch, Patent Lawyer, Jenifer Building, Washington.

Inventors—Record inventtion legally before disclosing to others. Our Invention-Record and Data Sheet shows how. Sent free and valuable information given on patent procedure, costs, etc. Report on patentability includes copies of patents nearest your idea . O'Connell & O'Connell, 400 Jenifer Bldg., Washington, D. C.

Patents Procured. Send sketch or model today for examination, prompt report and advice. No charge for preliminary advice. Write for free booklet and blank form on which to disclose your idea. Highest references. Promptness assured. Clarence A. O'Brien, Registered Patent Lawyer, 92-A Security Bank Building, Directly across the street from Patent Office, Washington, D. C.

The Patentome is Free. A liberal education in patents. Anderson & Son, attorneys, estb. 1865. 637 F St., N. W., Washington, D. C.

Monroe Miller, Ouray Bldg., Washington, D. C. Patent Attorney; Mechanical, Electrical Expert. Free Blue Book gives candid advice.

Patents Procured, Trade Marks Registered. A comprehensive, experienced, prompt service for the protection and development of your ideas. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request. Richard B. Owen, 130 Owen Bldg., Washington, D. C., or 2278-T Woolworth Bldg., New York.

Inventors—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee schedule, information free. Lancaster and Allwine, 242 Ouray Bldg., Washington, D. C.

Millions spent annually for ideas! Hundreds now wanted! Patent yours and profit! Write today for free books—tell how to protect yourself, how to invent, ideas wanted, how we help you sell, etc. American Industries, Inc., 212 Kresge Bldg., Washington, D. C.

Personal

150 "Funny" Jazzy Parodies on the Latest Popular Songs. Yes! We have no Bananas Today, Barney Google, My Wild Days Are Over, The Girl That Men Forget, etc. 25c prepaid. S. Collins Co., 32 Liberty Street, Hastings, Brooklyn, N. Y.

Exchange Interesting Letters with new friends. Write Dolly Gray Club, Box 186K Denver, Colorado.

Exchange jolly letters with new friends. Lots fun! Send stamp. Eva Moore, Box 903, Jacksonville, Fla.

Lonely Hearts, join our Club, be happy, correspondence everywhere, many wealthy, descriptions, photos free; either sex, most successful method, 23 years' experience. Standard Corr. Club, Grayslake, Ill.

Your Horoscope. Business, changes, social, matrimonial prospects. Send birthdate and 10 cents (stamps) for remarkable test reading. Zanya, 202-J West 105th Street, New York.

Leading club, largest, most reliable for lonely people. Established 19 years. Many wealthy members. Quick results. Mrs. Wrubel, Box 26, Oakland, Calif.

Correspondence Club—Many wealthy members everywhere. Fascinating particulars free. Smith, Box 1167Y, Denver, Colo.

Exchange Cheery Letters with new friends. Write Betty Lee Inc., 4254 Broadway, New York City. Stamp appreciated.

Phonographic Supplies

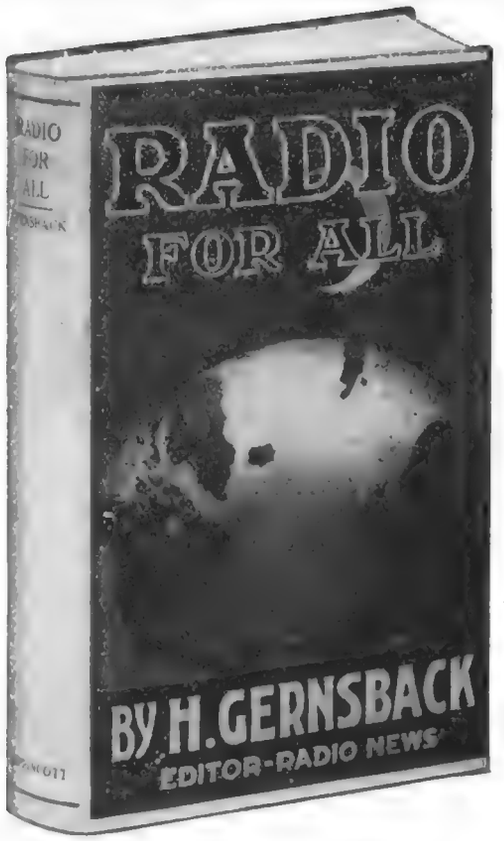
Build Your Phonograph. Quality phonoparts. Famous Serenade Motors. Also original Perfection Motors. Electric Motors, tonearms, reproducers, amplifiers, case material, accessories. Free blueprints and building instructions. Big Saving. Wonderful results. Prompt delivery. Catalog mailed for ten cents. Hoosier Mfg. & Supply Company, 321 Baldwin Block, Indianapolis, Indiana.

Postcards and Pictures

French Colonies Free—Pretty picture set, Native Chiefs, Tigers, 2c postage. Empire Stamp Company, 354 Lippincott, Toronto, Canada.

Send any photo or film and $2.00 for Fifty Genuine Photo postals. Barbeau's, Oswego, N. Y.

Digitized by Google
Original from UNIVERSITY OF CHICAGO



RADIO FOR ALL

By H. GERNSBACK

Editor "Radio News," "Science and Invention" and "Practical Electrics"

With over 130 *illustrations and diagrams, and* 12 *photographs,* 300 *pages, size* 8¼" *x* 5½".

What the novice in radio needs is a book in which he can get all the information necessary for him to understand radio telephony and telegraphy, to make or buy a receiving set suitable to his means, to know how to operate his set, and after he has an understanding of the radio art, information that will enable him to advance and get the most out of his outfit. All this must ordinarily be dug out of text-books, pamphlets and government publications, but the aim of this book is to have all the data and information that the beginner will need from the time that he takes up radio. It is a permanent, comprehensive reference book for the dyed-in-the-wool dabbler in Radio.

What the Book Is.

A combination of a radio course for the novice in radio telegraphy and telephony with a reference book for the more experienced amateur. Half a dozen books in one.

For the Beginner.

The theory of radio carefully explained with drawings.
Description of and instruction for operating instruments of receiving and sending sets, with all picture diagrams of the wiring of the apparatus.
How to make your own receiving set, costing from $3.00 to $50.00.
How to read diagrams; for every picture diagram there is a corresponding technical diagram using the symbols instead of drawings.
How to tune sharply and eliminate interference from other stations.
How to protect your set from lightning and the laws regarding installation.
Explanation of time and weather signals.

For the More Experienced Amateur.

How to make a practical vacuum tube detector, two stage amplifier set costing less than $50.00, that will work.
How the radio compass works.
All about underground aerials, loop aerials and directional aerials.
Formulae for finding wave length; miscellaneous formulae for finding capacity of condenser and other instruments. Tables of wire resistances, wave lengths and their corresponding frequencies, approximate wave lengths for different aerials, tuning coil data, and much more invaluable information.

Special Features.

Lists of all the broadcasting stations in the United States and Canada for concerts, time signals, weather reports, press, stock market reports, etc., with their call, wave length and time of sending.
Detailed description of Washington weather signals and their translation.
Description of a modern broadcasting station and its operation.
Large map showing location of all U. S. radio telephone broadcasting stations suitable for hanging up in radio room.
Collection of miscellaneous radio information for the amateur.

In Other Words.

The information that you ordinarily have to dig out of government publications, text-books, pamphlets, etc., is handily combined in this one book.

The Complete Book of All Radio Information

PRICE POSTPAID $2.00

PRACTICAL ELECTRICS COMPANY :: :: 53 PARK PLACE, NEW YORK CITY

The New

Science and Invention

In Pictures

THE STORY IS TOLD IN PICTURES under the new policy of SCIENCE & INVENTION. Comprehensive, timely and self-explanatory illustrations make the *NEW* SCIENCE & INVENTION more interesting than fiction.

SCIENCE & INVENTION combs the world for scientific news. It is represented by correspondents at every world capital, in every important laboratory — in fact at every place in the world where scientific development or achievement may occur.

EARLY AND ACCURATE REPORTS, careful handling by its editorial and art departments and the ability of its editor to give his readers just what they want has made SCIENCE & INVENTION a by-word and has won for it a place in every home.

AN ELABORATE NETWORK OF CORRESPONDENTS is maintained by SCIENCE & INVENTION. You can be part of this great system and enter our $12,000 PRIZE CONTEST. Write and ask for details. Get a Reporter's Card.

MORE THAN 100 PAGES — SPECIAL PRIZE CONTESTS — 300 ILLUSTRATIONS EACH MONTH.

Radio News

"The Largest Radio Magazine in the World"

RADIO NEWS is read by one million radio enthusiasts every month—a certain proof of its superiority, quality and popularity.

GREATER IN CIRCULATION, number of pages, articles and illustrations, it is the indisputable peer of radio magazines.

WHETHER YOU ARE a radio amateur, experimenter, dealer, manufacturer or layman, you will find much in RADIO NEWS of interest and value.

RADIO NEWS keeps you in touch with all new radio developments, new hookups, achievements, apparatus and with the field in general.

IF YOU HAVE ANY INTEREST WHATEVER in radio you should read RADIO NEWS every month. It will pay you to do it.

RADIO NEWS CONTAINS more articles by radio experts—more specific information — detailed drawings — illustrations and news—than is published in any other radio magazine.

EXPERIMENTER PUBLISHING CO.,
53 PARK PLACE, NEW YORK

Enclosed find .....dollars for which please enter my subscription to

..... for ..... years.

Name .....*Address* .....

S.I.-121

SUBSCRIPTION RATES

Radio News—One Year...$2.50
Radio News—Two Years.. 4.25
Science & Invention—One Year 2.50
Science & Invention—Two Years 4.25

(Canadian and Foreign 50 cents per year additional)

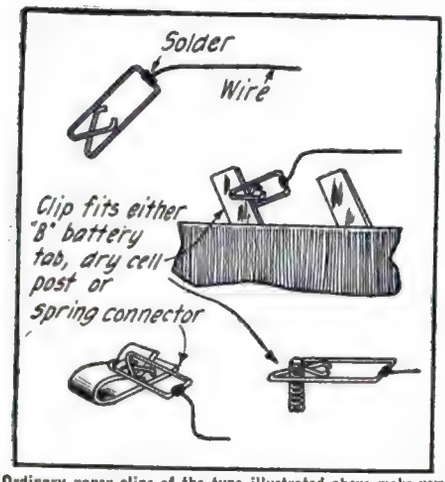
Or at all Newsstands at 25 cents Per Copy

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Radio Wrinkles

(*Continued from page* 943)

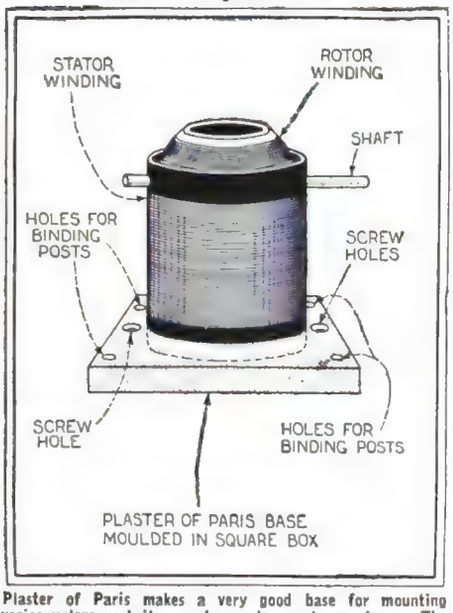
Simple Connectors



Ordinary paper clips of the type illustrated above make very good connectors for use on different radio apparatus. The illustration shows how they can be used for clipping on to "B" batteries, machine screws, or spring connectors.

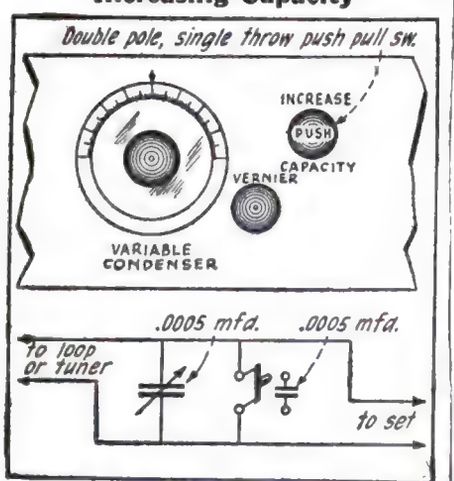
—L. B. Robbins.

VarioCoupler Bases



Plaster of Paris makes a very good base for mounting variocouplers and it may be made as shown above. The holes for the binding posts and mounting screws should be moulded directly into the base. The stator of the coupler should be put into place before the plaster of Paris sets.

Increasing Capacity



The capacity of a variable condenser may be increased by placing in parallel with it a small fixed condenser of the same capacity. This is connected with double-pole single-throw switch which should preferably be of the push-pull type. By closing the switch, the total capacity will be variable from .0005 to .001 mf.

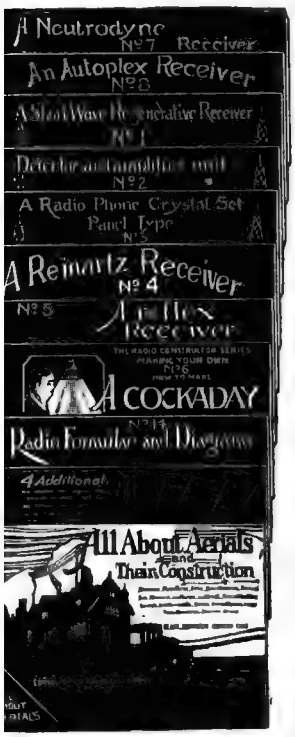
Atlas
LOUD SPEAKER
Natural Re-Production
PARKIN MANUFACTURING CO.
SAN RAFAEL, CALIFORNIA
October 20, 1923.
Multiple Elec. Products Co. Inc.,
Leo J. Meyberg Co., Representatives,
San Francisco, Calif.
Gentlemen:
TRADE MARK
A Record!
ENTHUSIASTIC TESTIMONY straight from an impartial authority. Re-PRODUCTION is a *fact*. The delicate overtones which give music its roundness, resonance and timbre, are faithfully re-born through the modern magic of the patented "double diaphragm." This extremely responsive device is adjustable to the exact requirements of your set and individual receiving conditions. *Write for Illustrated Booklet "T"*
Atlas Loud Speaker Unit
With Phonograph Attachment $13.50
Without Phonograph Attachment . . . $12.50
Letters From Users Requested
What have you accomplished with your Atlas Amplitone? Tell use about it.
Sole Canadian Distributors
The Marconi Wireless Telegraph Company of Canada, Limited
Ask Your Dealer for a Demonstration
List Price Complete
$25
Multiple Electric Products Co. Inc.
ORANGE ST., RADIO DIVISION NEWARK, N.J.

"THERE'S MONEY IN IT"
AT HOME
LEARN TELEGRAPHY
AT HOME
MORSE AND WIRELESS
TEACH YOURSELF in half usual time, at trifling cost, with the wonderful Automatic Transmitter THE OMNIGRAPH. Sends unlimited Morse or Continental messages, at any speed, just as an expert operator would. Adopted by U. S. Government, and leading Universities, Colleges and Telegraph Schools. 3 styles. $14 to $30. Catalog free.
If you own a Radio Phone Set and don't know the Code, you are missing most of the fun.
OMNIGRAPH MFG. CO. 22 Hudson St., NEW YORK

$300 Profit Monthly
Only 20 Monthly 8 HOUR Pays for Battery Charger
HB 8 HOUR Battery Charging Pays Big Monthly Profits
Small cash payment puts HB Constant Potential Outfit in your shop. Your increased profits easily carry the small $20 monthly terms, with good surplus besides. HB 8-Hour service builds trade, beats competition. An HB saves you $35 to $115 over any other outfit on purchase price alone. Sold on 30 days' free trial with money-back guarantee. HB Constant Potential saves current, labor and rental batteries. HB Patented Voltage Regulating Winding absolutely eliminates reversing. Write today for Bulletin 321.
HOBART BROS CO., Box 514, TROY, OHIO
Profits Easily Carry Small Monthly Payments
8 Hour Battery Ch
Small Cash Payment

Digitized by Google
Original from UNIVERSITY OF CHICAGO

"Make Your Own" with CONSRAD PATTERNS



How to Make a Short Wave Regenerative Receiver

This set was designed by a foremost radio engineer to fulfil the wants of an all-round broadcast receiver. It covers wave-lengths up to 800 meters..... **50c.**

How to Make Detector and Amplifier Units

This pattern was designed for detector and amplifying units especially adapted for use with our regenerative receiver. It is strongly recommended when the attachment of a loud speaker to that set is desired. **50c.**

How to Make a Cockaday Receiver

The Cockaday four-circuit tuner is one of the latest advancements in radio. Its main advantage lies in the fact that the set can be adjusted to the highest point of regeneration, and tuning accomplished over a wide band of wave-lengths without the necessity for readjusting the regeneration control. All dimensions, size of wire, number of turns, etc., are given leaving nothing to the imagination. ..... **50c.**

How to Make the S. T. 100

This is a two tube and crystal dual amplifier brought out by an Englishman, John Scott-Taggart. This is a very stable circuit and above all, very easy for the amateur to construct. Complete blue prints for drilling and wiring ..... **50c.**

14 Radio Formulae and Diagrams

With this packet you need never worry about schematic wiring diagrams, measurements and radio tables. All formulas and diagrams are printed on heavy paper. **50c.**

20 Radiophone Diagrams and Hook-Ups

These diagrams show how to get the best possible efficiency from the instruments you make or purchase. They cover hook-ups from the simplest to the most complicated, in a way that any amateur can understand and follow without difficulty. Printed on heavy paper, 8½x11¼ inches, and together with KEY CHART OF SYMBOLS and pamphlet "How to Read Diagrams", are contained in a heavy two-color envelope..... **50c.**

How to Make a Reinartz Receiver

The original Reinartz Receiver is the most popular type of set in existence today due to its simplicity of operation and capability of long-distance reception. Full directions for building this receiver are given in this folder. Two blue prints and instruction pamphlet in two-color manilla envelope. The connections of the set are shown plainly. ..... **50c.**

All About Aerials and their Construction

These blue prints were made after practical erection of each aerial, and point out how simple it is to erect not only the proper aerial for your particular need, but how to erect this aerial in the most practical manner and at the least expense. Consists of 12 blue prints 8½x11 inches and one four-page instruction pamphlet 8½x11 inches. ..... **50c.**

How to Make A Radiophone Crystal Set

Designed for those without technical knowledge. This set has a range of 30 miles. Packet consists of 4 page illustrated direction pamphlet and full size blue print for drilling and wiring. ..... **50c.**

How to Make an Autoplex Receiver

The long expected one-tube set that will work a loud speaker. Will operate wherever placed and requires but a ground connection. Every station within its range is amplified sufficiently for a loud speaker. Tuning is very simple, there being but two controls. Any tubes from the "peanuts" up to the "big ones" can be used. This receiver knows no such thing as "critical filament adjustment." The complete plans consist of full sized blue print for wiring and drilling and also a four-page instruction pamphlet giving complete details even as to tuning. ..... **50c.**

How to Make a Neutrodyne Receiver

This pattern gives the complete assembly, wiring, adjusting and tuning of a five-tube Neutrodyne receiver. This type of receiving outfit was brought out after extensive experimenting and is noted for its very efficient radio frequency amplification. All the disadvantages of ordinary radio receivers, such as distortion and re-radiation are eliminated. The circuit is also noted for keeping the tubes from oscillating. Put up in packet, with full size blue prints for drilling and wiring and four-page instruction pamphlet. ..... **50c.**

How to Make a Reflex Receiver

The plans for the reflex receiver were gotten out only after considerable research work by our engineers. Most people have trouble with reflex receivers. It takes an expert to build one that will work satisfactorily. The trouble lies in the values of condensers, etc., in the circuits. If they are incorrect, the set is a dismal failure. The construction details of a reflex receiver, contained in this folder, are the results of their successful efforts. ..... **50c.**

Order Direct From These Dealers—Or If Your Dealer

Abilene, Kans.
Union Elec. Co.
Albany, Ga.
Lonsbergs Book House
Akron, O.
Radioart Supply Co.
Albany, N. Y.
Havens Elec. Co.
Ignition Service Supply Co.
Cooper & Hotchkiss
Kimball Bros.
Peoples Radio Store
Standard Elec. Co.
Wanger Bros.
Amsterdam, N. Y.
Anderson Elec. Co.
Allentown, Pa.
Hess Bros.
Buchman Book Store
Altoona, Pa.
Altoona Elec. Supply Co.
Anthony, Kans.
LeRoy Hughbanks Rad. Co.
Astoria, L. I.
Astoria Radio Shop
Atchison, Kans.
Low & Blythe Elec. Co.
Atlanta, Ga.
Capital Elec. Co.
Millers Book Store
Atlantic City, N. J.
Paramount Radio Co.
Eastern Hdwe. & Sup. Co.
Sport Shop
Just Elec. Co.
Sea Coast Radio Co.
Auburn, Me.
G. L. Foss
Baltimore, Md.
Jos. A. Becker
Jos. M. Zamolski
Wilbur Elec Co.
Bacharach Rasin Co.
W. W. Hentzchel
S. B. Berkowich
Joel Gutman
Herdas Elec.
Little Joes Dept. Store
C. D. Kellert
J. Meyer
Murdock Co.
E. I. Rosenfeld & Co.
Batavia, N. Y.
H. F. Smith
Bethlehem, Pa.
Lehigh Radio Co.

Billings, Mont.
Torgerson Bros.
Birmingham, Ala.
Interstate Elec. Co.
Bluefield, W. Va.
Burgess Elec. Co.
Boston, Mass.
Atlantic Radio Co.
Cutter & Wood Supply Co.
Seth Fuller Co.
International Radio Corp.
Lewis Elec. Supply
F. D. Pitts Co.
New Eng. Elec. Spec. Co.
Williams Book Stores
J. B. Hunter & Co.
Samuel J. Beckwith
Chandler & Farqhuar Co.
A. P. Merchant Co.
Eugene Proctor Co., Inc.
Radio Sales & Service Co.
Farrington & Clark
Berman Radio
Bridgeport, Conn.
Morison Radiophone Parts
Flynn & Power
Conn. Radio Supply Co.
Brooklyn, N. Y.
Arthora
Brooklyn Radio Serv. Co.
O. Olsen
Tollner Elec. Co.
Bklyn. Radio Center
Robs Radio Service
Bklyn Elec. Lamp & Nov.
Boro Hall Radio
Globe Radio & Bat. Shop
Haag & Vince Co.
G. Kleinteich
C. G. Rosewall
J. Streiff
Denmarks
American Phon. Exch.
Arlington Radio Service
Barneys Radio Shop
Bengo Elec. Co.
J. D. Cunningham
Delta Elec. Co.
H. A. Dietz
Duckmans Music Store
Kelley & Feist
Halpern Elec. Co.
Kensington Radio
E. C. & H. B. Lagerholm
G. Moskowitz
G. Scharff Sons

H. Schur & Son
Victor Radio Sport Shop
Walker Elec. Co.
Breuer Bros.
20th Century Radio Co.
Morch Radio
M. Ulrich
B. Haupt
David M. Isaac
Starr Radio
Buffalo, N. Y.
McCarthy Bros. & Ford
Robertson Cataract
O. Ulbrich Co.
Burlington, N. J.
Burlington Elec. Co.
Butte, Montana
Montana Elec. Co.
Cambridge, Mass.
Clapp-Eastham Co.
University Book Store
Canton, Ill.
Frank White & Bros.
Camden, N. J.
Neisner Bros.
Carrollton, Mo.
Carrollton Radio Shop
Centerville, Ia.
H. E. Luther
Champagne, Ill.
H. C. Swanell & Son
Charleston, W. Va.
John R. Koch
Charlestown, S. Car.
S. C. Radio Shop
Charlotte, N. C.
Smith Novotoy Elec. Co.
Caroline Radio Co.
Chester, Pa.
Neisner Bros.
Chicago, Ill.
Harry Alter & Co.
Barawik Co.
Beckley-Ralston Co.
Chicago Radio App. Co.
Elec. Appliance Co.
Inland Elec. Co.
Marshall-Field & Co.
A. C. McClurg & Co.
Montgomery Ward & Co.
Newark Elec. Co.
Henry Paulson & Co.
Sears-Roebuck & Co.
Chicago Cut Rate Book

Community Book Store
Isenstark Radio Co.
Follett Book Co.
McArthur Elec. Co.
P. O. News Co.
Max Stein
E. J. Stringos
Fireside Radio Co.
Cincinnati, O.
Midwest Radio Co.
Milnor Elec. Co.
Reuter Elec. Co.
Cleveland, O.
Radio Electric Shop
Radio Eng. & Sales Co.
H. Lesser & Co.
Oliver C. Schroeder
Radio Sales & Rep. Co.
Columbus, O.
Hall Elec. Co.
Coraopolis, Pa.
T. C. O'Donovan
Cumberland, Md.
J. A. Fulton & Co.
Dallas, Texas
Huey & Philip Hdwe. Co.
Southwest Radio Sup. Co.
Radio Equip. Co.
Denton, Tex.
Evers Hdwe. Co.
Denver, Colo.
Electrical Auto App. Co.
Pratt Book Store
Reynolds Radio Co.
Des Moines, Ia.
H. W. King
Iowa Radio Co.
Detroit, Mich.
Federal Elec. Supply Co.
Twentieth Century Radio Co.
Crowley Milner Co.
McCaulay Bros.
Detroit Elec. Co.
Wolverine Radio Co.
Northwestern Radio Co.
Duluth, Minn.
Kelley Duluth Co.
Easton, Pa.
F. & W. Grand Stores
E. Orange, N. J.
Essex Radio Shop
United Radio & Sport Shop
Elizabeth, N. J.
H. Richmond & Son
Elizabeth Elec. Sup. Co.

Eureka, Ill.
Klaus Radio Co.
Fergus Falls, Minn.
Grande & Sether
Far Rockaway, L. I.
Dunlap Sptg. Goods Co.
Scientific Radio Co., Inc.
Flushing, L. I.
The Electric Shop
Ft. Worth, Tex.
H. C. Meacham Co.
Galveston, Tex.
Galveston Wireless Sup. Co.
Gardner, Mass.
Gardner Hdwe. Co.
Gloucester, N. J.
Lenny's Variety Store
Granite City, Ill.
Rosenberg Dept. Store
Great Bend, Kans.
Great Bend Radio Co.
Greensburg, Pa.
H. Hamilton
Hamilton, O.
Radio Co.
Hartford, Conn.
Elec. Sup. & Equip. Co.
F. & W. Grand Stores
G. Fox & Co.
Havana, Cuba
Diamond News Co.
Liberia de Jose Albele
Helena, Mont.
Van Blaricom Co.
Hoboken, N. J.
International Book Store
Eagans Radio
Holyoke, Mass.
Haskell Elec. Co.
Independence, Mo.
The Melodian Co.
Hackensack, N. J.
Wurtz & Fuchs
Jacksonville, Fla.
Southern Elec. Co.
Holt Elec. Co.
Jamestown, N. Y.
Willis Switch & Inst. Co.
Jamaica Plain, Mass.
Conrad Radio Co.
Jamaica, L. I.
Scientific Radio Co., Inc.
Merrick Elec. Co.
Jersey City, N. J.
Arrow Elec. Co.

M. Schlein
Guarantee Elec. Co.
Johnson City, Tenn.
Bishop Elec. Co.
Johnstown, Pa.
W. T. Grant Co.
Joliet, Ill.
Joliet Book & Sta. Co.
Kansas City, Mo.
Vulcanizers Supply Co.
Donaldson Radio Co.
Lancaster, Pa.
Radio Outfit. & Sup. Co.
Lawrence, Mass.
Schwarzenberg, W.
Los Angeles, Cal.
Leo J. Meyberg
S. California Elec. Co.
West Radio Elec. Co.
Radio Concert & Equip.
Natick Book Store
Prode Elec. Co.
Lewiston, Montana
Chas. Williams
Lock Haven, Pa.
Burkett Bros.
Louisville, Ky.
Sutcliffe Co.
Lowell, Mass.
G. A. Hill Co.
Lyons, Kans.
R. I. Case
Macon, Ga.
J. W. Burke Co.
Memphis, Tenn.
Street Elec. Co.
McKeesport, Pa.
F. C. Wampler & Son
Milwaukee, Wis.
Julius Andrae & Co.
Dewey Sport Goods Co.
Badger Radio Co.
Minneapolis, Minn.
Jacob Andressen Co.
Findley Elec. Sup. Co.
Nagell Hdwe. Co.
Reinhard Bros. Co., Inc.
Sterling Elec. Co.
Peerless Elec. Co.
Missoula, Mont.
Missoula Elec. Sup. Co.
Montgomery, Ala.
Alabama Radio Mfg. Co.
R. P. Reeves

The Consrad Co INC.

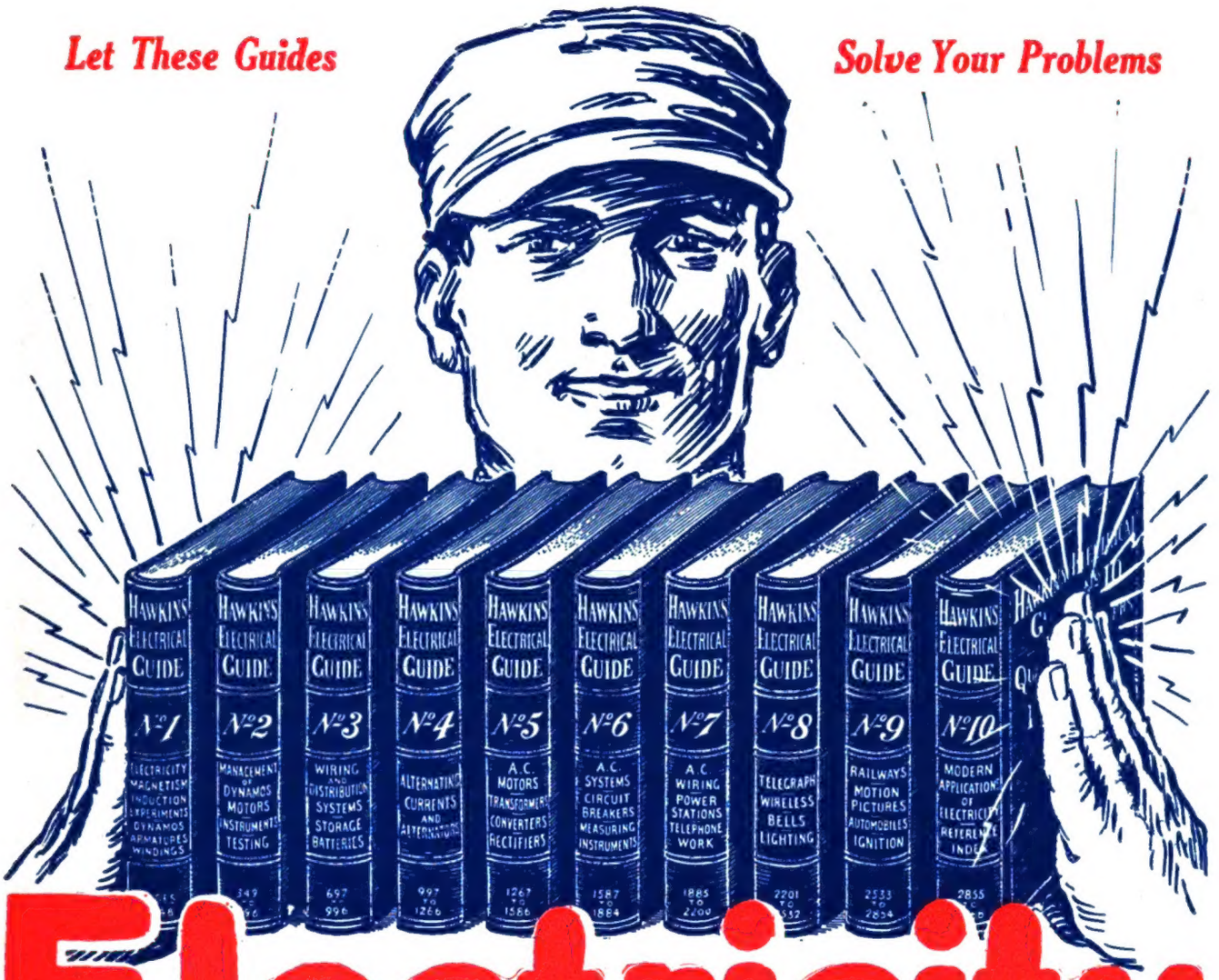
233 Fulton Street

Publishers of Consolidated Patterns

Formerly The Consolidated

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Let These Guides *Solve Your Problems*



Electricity at your finger ends

HAWKINS ELECTRICAL GUIDES

IN TEN VOLUMES

3500 PAGES **$1 A VOLUME**
4700 PICTURES **$1 A MONTH**

Know the facts in Electricity. They mean more money and better position for you. Hawkins Guides tell you all you need to know about Electricity. Every important electrical subject covered so you can understand it. Easy to study and apply. A complete, practical working course, in 10 volumes. Books are pocket size; flexible covers. Order a set today to look over.

LEARN ALL ABOUT

Magnetism—Induction—Experiments — Dynamos — Electric Machinery—Motors—Armatures—Armature Windings—Installing of Dynamos—Electrical Instrument Testing—Practical Management of Dynamos and Motors—Distribution Systems—Wiring—Wiring Diagrams — Sign Flashers — Storage Batteries — Principles of Alternating Currents and Alternators — Alternating Current Motors —Transformers — Converters—Rectifiers—Alternating Current Systems — Circuit Breakers — Measuring Instruments—Switchboards—Wiring—Power Stations—Installing —Telephone—Telegraph—Wireless—Bells—Lighting—Railways. Also many Modern Practical Applications of Electricity and Ready Reference Index of the ten numbers.

SHIPPED FREE

Not a cent to pay until you see the books. No obligation to buy unless you are satisfied. Send Coupon now—today—and get this great help library and see if it is not worth $100 to you—you pay $1.00 a month for ten months or return it.

SEND NO MONEY—SEND ONLY THIS COUPON

THEO. AUDEL & CO.,
72 Fifth Ave., New York City

Please submit me for free examination, HAWKINS ELECTRICAL GUIDE (Price $1 a number). Ship at once prepaid, the 10 numbers. If satisfactory, I agree to send you $1 within seven days and to further mail you $1 each month until paid.

Name .....

Occupation .....

Employed by .....

Home Address .....

Reference .....

S.I. Jan.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

I Can Qualify You as a Radio Expert in a Few Months!

E. R. HAAS
President National Radio Institute

Learn at Home
Earn $2500 to $15000 a Year

Merle Wetzel, one of my students, reports that he is now making *three times* what he did before becoming a radio expert. Emmett Welch writes that after finishing my training, he made $300 a month and all expenses. George Jones says "To your course I credit my present position as manager of this Radio Department." Hundreds of other former students enthusiastically tell of their successes as radio experts! The field of Radio today is a real treasure house of wonderful opportunities. It offers rewards beyond your fondest dreams! Mail coupon today for my Free Book just out—which explains in detail the amazing opportunities in this World's Fastest-Growing Industry.

Hundreds of Big Paying Positions Waiting

Do you want to earn far more money than you ever dreamed possible? Do you want to be your own boss?—to have a profitable business of your own? Do you want to travel the whole world over—and make big money while doing so?

Radio offers you all of these opportunities—and more! Radio, the new infant industry; Radio, growing with leaps and bounds; Radio the field of endeavor with the most promising future of all!

Never in all history has an industry jumped into prominence so rapidly! Millions of dollars were spent last year on Radio. Hundreds of big money positions were created almost overnight. Thousands of men trained in Radio were needed. And the future holds even greater promise for those who enter this fascinating field. Learn more about what Radio can offer *you*.

Send for our new FREE BOOK on Radio.

Pick Out the Job You Want We Will Help You Get It

This is a brief list of the positions in the Radio field today, and the salaries paid:

Broadcasting Station Operator, $125 to $250 a month.
Commercial Land Station Operator, $150 a month and up.
First Class Ship Operator, $105 a month in addition to all expenses paid.
Radio Engineer, up to $10,000 a year.
Radio Inspector, $1,800 to $4,500 a year.
Radio Salesman, $2,000 to $10,000 a year.
Radio Mechanic, $1,500 to $4,000 a year.
Radio Instructor, $150 to $250 a month.
Radio Draftsman, $7 to $15 a day.
Radio Executives up to $10,000 a year.

NOTE: RADIO FIRMS Secure Practical Radio Experts Among Our Graduates. *Write Today.*

This Wonderful *Free Book* Has Shown Thousands the Way to Bigger Money

This Free Book has opened the eyes of thousands to the glorious opportunities in Radio. If *you* are ambitious—if you are looking for a field which offers *big money, fascinating work, advancement, and a real future,* send for this Free Book. It costs you nothing. You obligate yourself in no way. Yet this book can easily mean all the difference between the work you are doing now and wonderful success! Before you forget—mail the coupon NOW!

NATIONAL RADIO INSTITUTE
Dept. 14-AA, Washington, D. C.

E. R. HAAS,
NATIONAL RADIO INSTITUTE,
Dept. 14-AA, Washington, D. C.

Without obligation on my part, please send me the free book "Your Opportunity in Radio", with full details as to how I can quickly train for the position of "Certified Radio-trician" in my spare hours at home. Also tell me how your free Employment Service will help me secure a good paying position, and about your special short-time offer.

Name .....

Street .....

City ..... State .....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Exchange

Gundlach Telescope, three inch objective lens, seventy dollars, real bargain. Edward Prentice, Binghamton, N. Y.

For Sale. Complete outfit for the manufacture of Radio Variable Condensers, including dies, jigs, parts, finished and unfinished condensers. Exceptionally cheap. Write for detailed information. Zeunert Mfg. Co., 1752 North Park Ave., Chicago, Ill.

For Inventors

Patent Application, including one sheet drawings, prepared for $15. Further particulars. Arthur M. Benner, Olympia, Washington.

Get your own patents. Application blanks, complete instructions $1. Cutting Bros., Campbell, Calif.

Your Chemical problem solved and working process furnished for Five Dollars. Write me. W. Stedman Richards, Consulting Chemist, Box 2402, Boston, Mass.

Specialized service for inventors. You furnish the idea, we'll work it out. Expert machine designing. Drafting. Opinions given on practicability of ideas. Confidential dealings. Your ideas fully protected. Write for full particulars. Otis Engineering Co., Desk EF, Omaha, Nebraska.

Formulas

Moneymaking Books, Plans, Formulas. Catalog Free. Ideal Book Shop, 5501-E, North Robey, Chicago.

For the Photographer

Have you a Camera? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 118 Camera House, Boston, 17, Mass.

Games and Entertainment

Tricks, Puzzles, Jokes, Magical Apparatus, Plays. Stage Supplies, Mind-Reading, Acts and Sensational Escapes. Send 10c for 160-page illustrated 1923 professional catalogue. Oaks Magical Co., Dept. 549, Oshkosh, Wis.

Health

Study Sexology—Publication dealing forcefully with the vital problems of intimate marital sex life will be sent on receipt of 20c—Health and Life Publications, Dept. 108, 833 S. Dearborn Street, Chicago, Illinois.

Free to Men—Information of a scientific nature that has brought physical vigor and happiness to thousands. No charge; no obligation. Enclose stamp for reply. C. I. Wood & Co., Colorado Springs, Colorado.

Help Wanted

We want Salesmen and Agents, either whole or side line to sell our low priced radio books to the trade. Excellent proposition for live wires. The E. I. Company, Publishers, 233 Fulton Street, New York City.

Detectives Earn Big Money. Travel. Excellent opportunity. Great demand everywhere. Experience unnecessary. Particulars free. Write, American Detective System, 1976 Broadway, N. Y.

Get posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 932.

Railway Postal Clerks—Start $133 month. Railroad pass; expenses paid; questions free. Columbus Institute, H-4, Columbus, Ohio.

Be a Detective; Excellent opportunity; good pay; travel. Write C. T. Ludwig, 1417 Westover Bldg., Kansas City, Mo.

Make Money in spare time mailing letters. Rare opportunity now. Men, send addressed envelope for special plan. Normande R, 147 W. 23d St., New York.

All men, women, boys, girls, 17 to 65, willing to accept Government positions, $117-$250, traveling or stationary, write Mr. Ozment, 293, St. Louis, Mo., immediately.

Silvering Mirrors, French plate. Easily learned, immense profits. Plans free. Wear Mirror Works, Excelsior Springs, Mo.

Earn $25 Weekly, spare time, writing for newspapers, magazines. Experience unnecessary; details free. Press Syndicate, 5665 St. Louis, Mo.

Firemen, Brakemen, Baggagemen, Sleeping car, train porters (colored). $140-$200. Experience unnecessary. 897 Railway Bureau, E. St. Louis, Ill.

U. S. Government wants help. Men-Women 18 up. $92-$250 month. Steady. Vacation, influence unnecessary. List positions free. Write immediately. Franklin Institute, Dept. E24, Rochester, N. Y.

South America Needs skilled help. Write Employers Direct. 388 Addresses $1. South America Information Bureau, Portland, Oregon.

Wanted—Railway Mail Clerks. $1600. Experience or correspondence course unnecessary. Write, Mr. Selby, D78, Willow Hill, Ill.

Improved Made Toys

Wanted Manufacturers and Houseworkers to manufacture Metal Toys and Novelties. Wonderful opportunity. Millions needed. In Whistling Birds, Wild Animals, Wag Tail Pups, Crowing Roosters, Automobiles, Baseball Players, Statue of Liberty, Indians, Toy Soldiers, Barking Dogs; and 50 others. No experience or tools necessary. Guaranteed casting forms with complete outfit, at cost. From $3.50 up. We buy goods all year. Cash on delivery. Higher price for finished goods. Contract orders placed. Send for catalog and information free. The Improved Metal Casting Co., 343 East 145 St., New York.

Instruction

Instruct Yourself for desired Successes. Illustrative chart shows Success(ive) Steps. Postpaid 50 cents. J. E. Morrey, Box 304, Madison Sq. Sta., N. Y.

Learn Chemistry at Home. Dr. T. O'Conor Sloane, noted educator and scientific authority, will teach you. Our home study correspondence course fits you to take a position as chemist. See our ad on page 917 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

Insects Wanted

Get posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 932.

Languages

World-Romic System, Masterkey to All Languages. Primers, 23 languages, $1.94 each language: English, French, German, Italian, Portuguese, Spanish. Pronunciation—Tables, 102 languages, 30c each language. Language Publishing Company, 8 West 40th Street, New York.

Manufacturing

To order: Metal articles, simple, or complicated machinery. Models, tools, patterns. Experimenting, Parma Engineering Works, Brooklyn Station, Cleveland, O.

Machinery and Tools

Concrete Building Block Machines and Molds. Catalogue free. Concrete Machine Co., 305 South Third St., St. Louis, Mo.

Miscellaneous

Free Complete Price List. Aitken Radio Co., 504 Superior St., Toledo, O.

Kodak + Hospital. Camera-Exchange. Used Cameras sold, exchanged, bought (any condition). Expert Camera Repairing a specialty. Send your broken Camera. Turner. 1679 Ave. A, N. Y.

Stuck? What is it? A problem, question or experiment in radio, physics, chemistry, biology, electricity, mathematics, etc. Prompt and accurate information furnished amateurs. Enclose one dollar to cover expenses. Address Society Amateur Scientists Bureau, Technical Information, 225 Lynch St., Brooklyn, N. Y.

We Develop your ideas into commercial shape for presentation to purchasers, making working models, drawings, experiments or tests. Courtesy, efficiency, secrecy and ample equipment; 30 years' experience. Ducorron-Rich Engineering Co., 504 Pacific Manual Bldg., Los Angeles, Cal.

Get posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 932.

Price List of packets, sets, single stamps free upon request. Premium to approval applicants. Yonkers Exchange, Yonkers, N. Y.

Questions Answered on any subject. One dollar each. Money returned if answer cannot be given. Fee for elaborate investigations and reports arranged by correspondence. Technical Associates, P. O. Box 1478, Boston, Mass.

Motion Picture Business

$35 Profit Nightly. Small capital starts you. No experience needed. Our machines are used and endorsed by Government institutions. Catalog free. Atlas Moving Picture Co., 470 Morton Bldg., Chicago, Ill.

Motorcycles—Bicycles

Build it Yourself—A Real Automobile that any handy man or boy can build. A low-slung, speedy cycle car. Power supplied by famous 2½ H.P. Shaw Motor. Send stamp today for Descriptive Circulars or send 25c for Complete Book of Easy-To-Follow Plans. Shaw Mfg. Co., Dept. S.I.-1, Galesburg, Kansas.

Novelties

Magic goods, cards, books, novelties. Catalogue free. Clifford Fenner, 2401 Jefferson, Louisville, Ky.

Patents

Inventions Commercialized. Patented or unpatented. Write Adam Fisher Mfg. Co., 205, St. Louis, Mo.

Unpatented ideas can be sold. I tell you how and help you make the sale. Particulars free. Write W. B. Greene, Jenifer Building, Washington, D. C.

Patents For Sale

For Sale—Patents: Nut and Bolt Locks, designed to resist vibration; Metal toy Aeroplane, useful and decorative. Weather-vane for barns, garages, etc. M. B. Rumfelt, South Lima, N. Y.

Brush's Pad, No. 1,224,581 for $16,000.00. C. B. Tyford, 617 Bailey St., Zanesville, Ohio.

Patent Attorneys

Patents. Send for free booklet. Highest references. Best results. Promptness assured. Send model or drawing for examination and opinion. Watson E. Coleman, Patent Attorney, 644 G Street N. W., Washington, D. C.

Inventors write me about patents. My fees payable monthly. Booklet free. Frank Fuller, Washington, D. C.

Herbert Jenner, Patent Attorney and Mechanical Expert, 624 F Street, Washington, D. C. I report if patent obtainable and exact cost. Send for circular.

Lacey Patent-Sense. "The book the inventor keeps." Free. See page 924.

M. P. Laughlin, Patents. Engineer-Attorney, 48 East 41 Street, New York.

H. F. Lowenstein, Registered Patent Attorney, Radio Expert, 825 McLachlen Building, Washington, D. C.

"Inventors' Guide" free on request; gives valuable information and advice for all who have original ideas or improvements. Frank Ledermann, Registered Attorney and Engineer, 15-E Park Row, New York.

"Inventor's Adviser," the valuable Patentbook with 139 mechanical movements and illustrations, sent free upon request. M. I. Labiner, Patent Attorney, 3 Park Row, New York.

Patents, Trademarks, Copyrights procured; all countries; very reasonable; 20 years' experience; booklet Free. H. Sanders, Registered Patent Attorney, 13 Rand McNally Building, Chicago.

Commercialize your ideas according to My Cooperative Plan. Booklet free. Ralph Burch, Patent Lawyer, Jenifer Building, Washington.

Inventors—Record inventtion legally before disclosing to others. Our Invention-Record and Data Sheet shows how. Sent free and valuable information given on patent procedure, costs, etc. Report on patentability includes copies of patents nearest your idea . O'Connell & O'Connell, 400 Jenifer Bldg., Washington, D. C.

Patents Procured. Send sketch or model today for examination, prompt report and advice. No charge for preliminary advice. Write for free booklet and blank form on which to disclose your idea. Highest references. Promptness assured. Clarence A. O'Brien, Registered Patent Lawyer, 92-A Security Bank Building, Directly across the street from Patent Office, Washington, D. C.

The Patentome is Free. A liberal education in patents. Anderson & Son, attorneys, estb. 1865. 637 F St., N. W., Washington, D. C.

Monroe Miller, Ouray Bldg., Washington, D. C. Patent Attorney; Mechanical, Electrical Expert. Free Blue Book gives candid advice.

Patents Procured, Trade Marks Registered. A comprehensive, experienced, prompt service for the protection and development of your ideas. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request. Richard B. Owen, 136 Owen Bldg., Washington, D. C., or 2278-T Woolworth Bldg., New York.

Inventors—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee schedule, information free. Lancaster and Allwine, 242 Ouray Bldg., Washington, D. C.

Millions spent annually for ideas! Hundreds now wanted! Patent yours and profit! Write today for free books—tell how to protect yourself, how to invent, ideas wanted, how we help you sell, etc. American Industries, Inc., 212 Kresge Bldg., Washington, D. C.

Personal

150 "Funny" Jazzy Parodies on the Latest Popular Songs. Yes! We have no Bananas Today, Barney Google, My Wild Days Are Over, The Girl That Men Forget, etc. 25c prepaid. S. Collins Co., 32 Liberty Street, Hastings, Brooklyn, N. Y.

Exchange interesting Letters with new friends. Write Dolly Gray Club, Box 186K Denver, Colorado.

Exchange jolly letters with new friends. Lots fun! Send stamp. Eva Moore, Box 908, Jacksonville, Fla.

Lonely Hearts, join our Club, be happy, correspondence everywhere, many wealthy, descriptions, photos free; either sex, most successful method, 23 years' experience. Standard Corr. Club, Grayslake, Ill.

Your Horoscope. Business, changes, social, matrimonial prospects. Send birthdate and 10 cents (stamps) for remarkable test reading. Zanya, 202-J West 105th Street, New York.

Leading club, largest, most reliable for lonely people. Established 19 years. Many wealthy members. Quick results. Mrs. Wrubel, Box 26, Oakland, Calif.

Correspondence Club—Many wealthy members everywhere. Fascinating particulars free. Smith, Box 1167Y, Denver, Colo.

Exchange Cheery Letters with new friends. Write Betty Lee Inc., 4254 Broadway, New York City. Stamp appreciated.

Phonographic Supplies

Build Your Phonograph. Quality phonoparts. Famous Serenade Motors. Also original Perfection Motors. Electric Motors, tonearms, reproducers, amplifiers, case material, accessories. Free blueprints and building instructions. Big Saving. Wonderful results. Prompt delivery. Catalog mailed for ten cents. Hoosier Mfg. & Supply Company, 321 Baldwin Block, Indianapolis, Indiana.

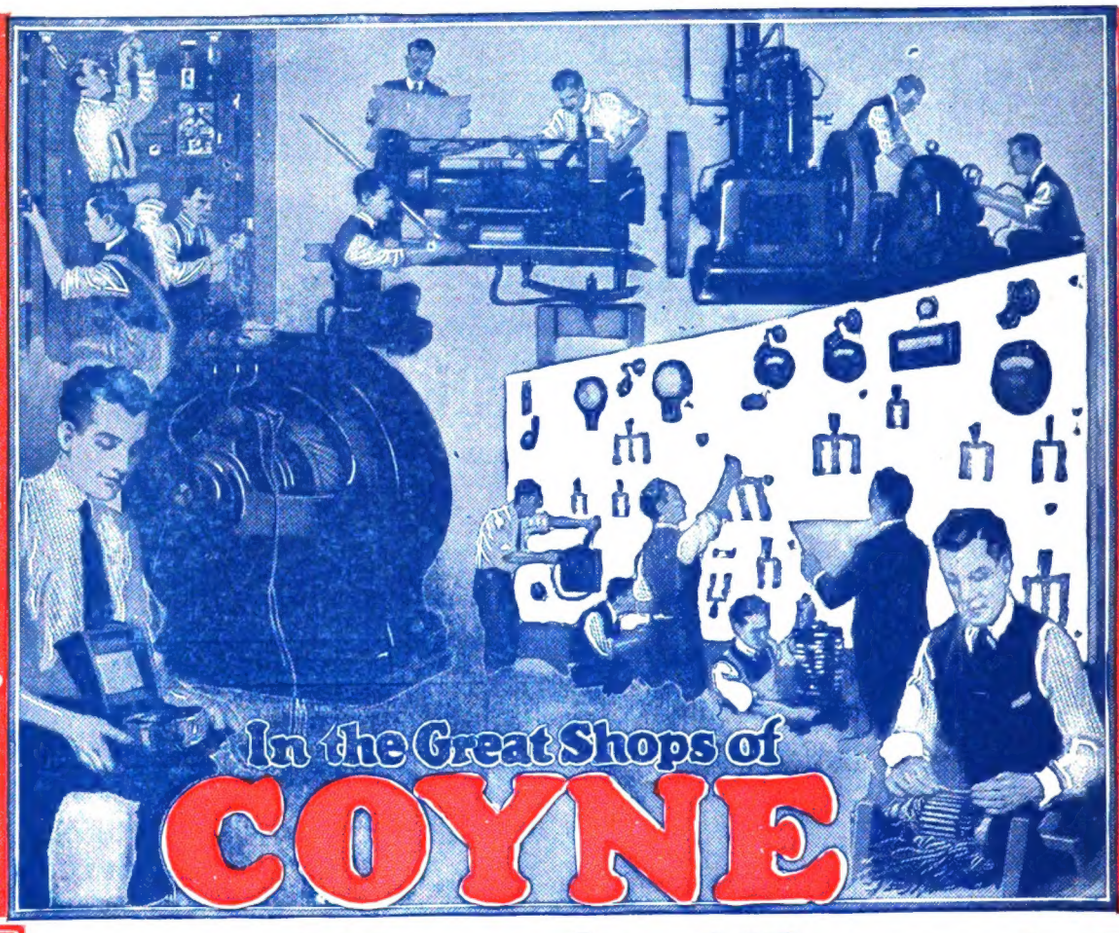
Postcards and Pictures

French Colonies Free—Pretty picture set, Native Chiefs, Tigers, 2c postage. Empire Stamp Company, 354 Lippincott, Toronto, Canada.

Send any photo or film and $2.00 for Fifty Genuine Photo postals. Barbeau's, Oswego, N. Y.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

LEARN



ELECTRICITY

IN 3½ MONTHS

Be An Electrical Expert

THE whole world of electricity is open to the Coyne trained Electrical Expert. Come to Chicago—the Electrical Center of the World. Get your training at Coyne—the oldest, largest and best school of practical electricity in the country—the only school endorsed by the Electrical Industry. Coyne trains you in all branches of electricity. We do not offer a number of individual courses—we give you just one *Complete* course so that you will be an *Electrical Expert* capable of commanding big pay. Let ordinary electricians do the small jobs. You can become an *Expert* and get the big money in any branch of electricity if you seize this chance to come to Coyne. Opportunities for *Experts* are unlimited. Get started now!

Greatest Outlay of Electrical Apparatus in the Country

No books or useless theory. You are trained on the greatest outlay of electrical apparatus of any institution in the entire country, in 3½ months (stay longer if you wish). Every thing from door bells to power plants. You work on Circuits, Housewiring, D. C., A. C., Armature and Stator Winding, Drafting, Auto, Truck and Tractor Electricity, Battery Building and Repairing and Radio—everything to make you an expert ready to step right into a position paying from $65 to $150 a week, or go into business for yourself and make up to $20,000 a year.

Coyne Trains You for Life

We furnish every student with a Life Scholarship which enables you to stay as long as you want or come back for further training at any time without charge. We also assist students to good paying positions after graduation.

We give you free a course in Radio—the marvel of the age. Constructing, installing and operating. You can build your own radio receiving set.

Hundreds of Coyne graduates are making big money as Electrical Experts. You can do the same if you get started at once. The electrical industry is crying for EXPERTS—don't pass up a chance to train yourself for one of these big paying jobs.

MAKE $250 to $600 A MONTH

Earn while you learn! *We help students to secure jobs to earn a good part of their expenses while learning*

Coyne Electrical School,
1300-1310 W. Harrison Street,
Dept. 53-32 Chicago, Illinois

Gentlemen: Please send me free your big catalog and full information about your 3½ month's practical training and special offer.

Name.....

Address.....

.....

Send this Coupon Now

Send this coupon now. Determine today that you are going to become a part of the world's greatest force—electricity. Assure your future by sending this coupon now. It brings you full information. Think of it—if you send the coupon today, you can be fully equipped for a fine paying electrical job in a few months. Send coupon now before the special offer we are making is withdrawn.

COYNE Electrical School
Endorsed by Electrical Industry

1300-1310 W. Harrison St., Dept. 53-32 Chicago, Ill.

Digitized by Google
Original from UNIVERSITY OF CHICAGO